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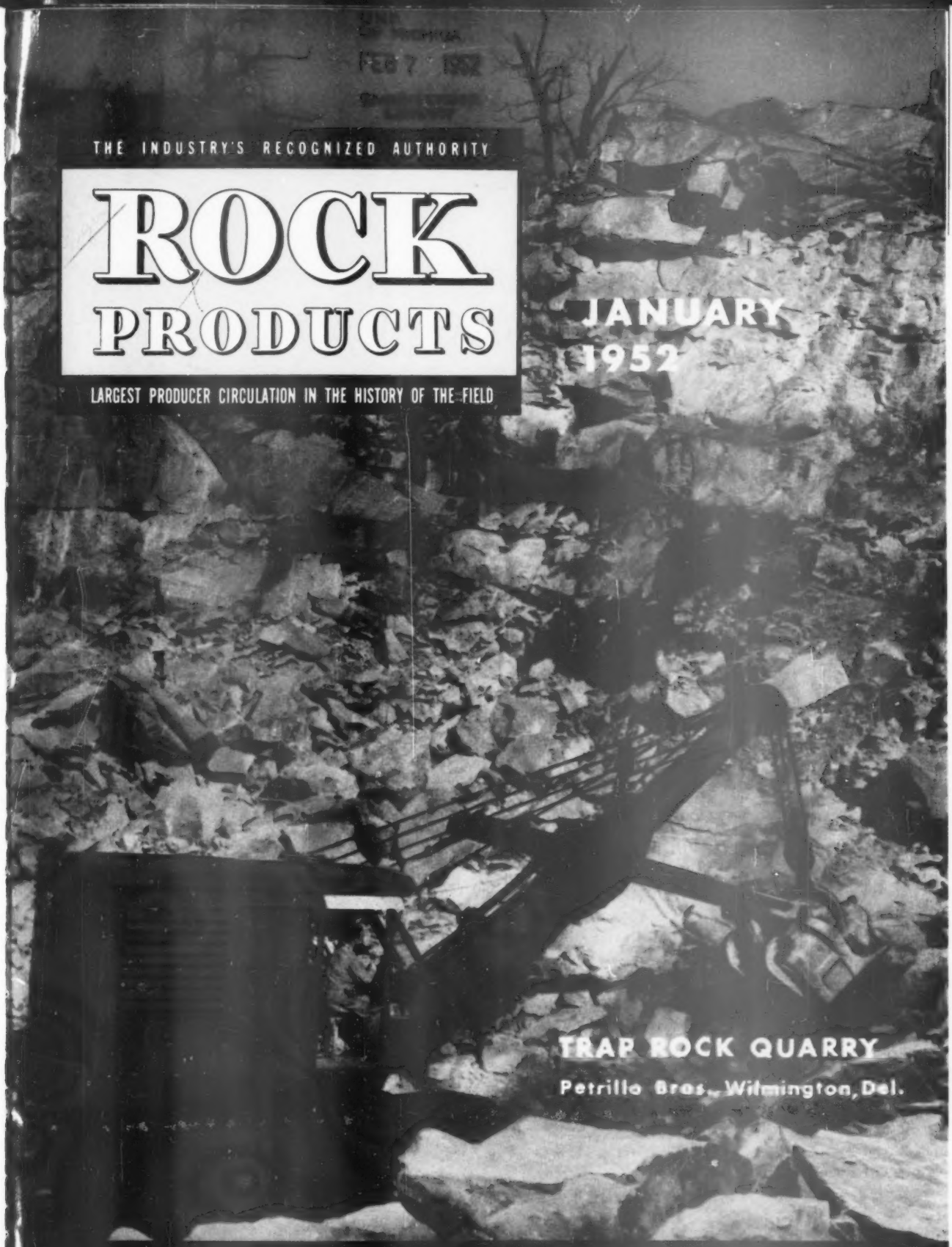
THE INDUSTRY'S RECOGNIZED AUTHORITY

ROCK PRODUCTS

LARGEST PRODUCER CIRCULATION IN THE HISTORY OF THE FIELD

JANUARY 1952



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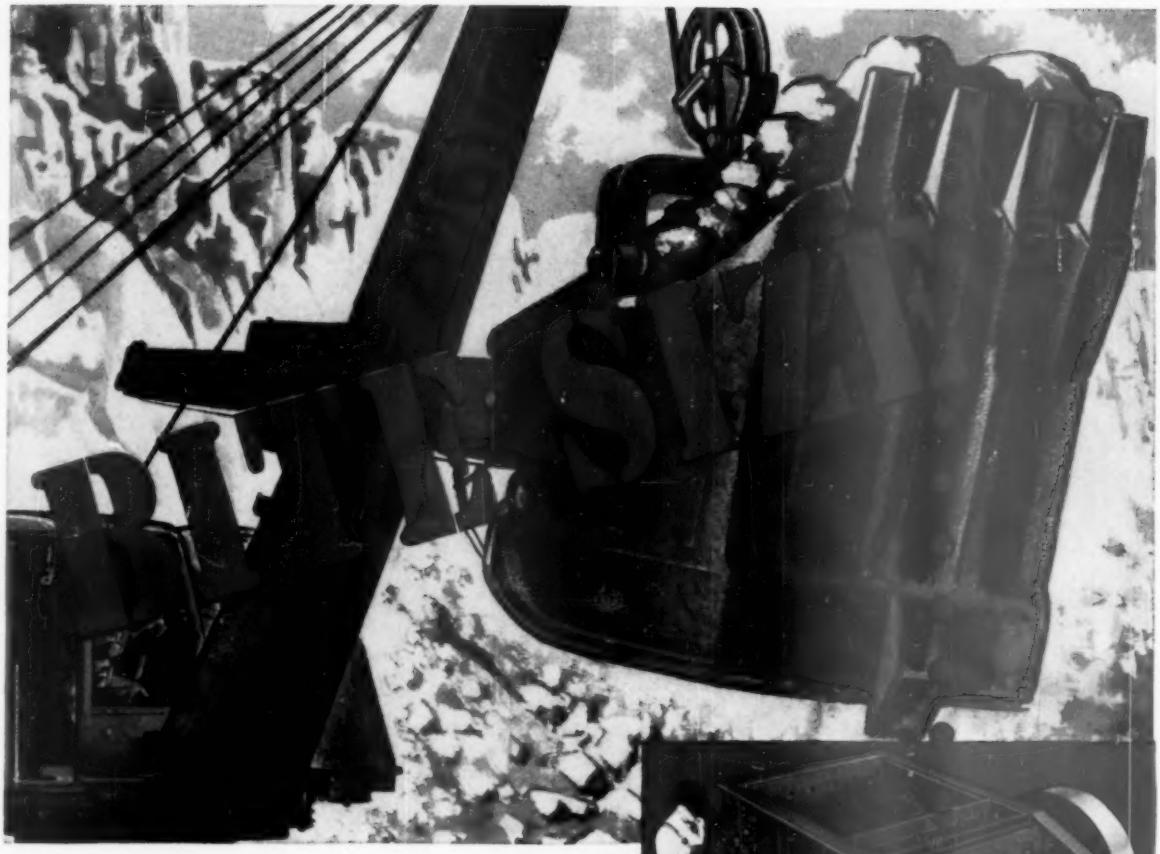
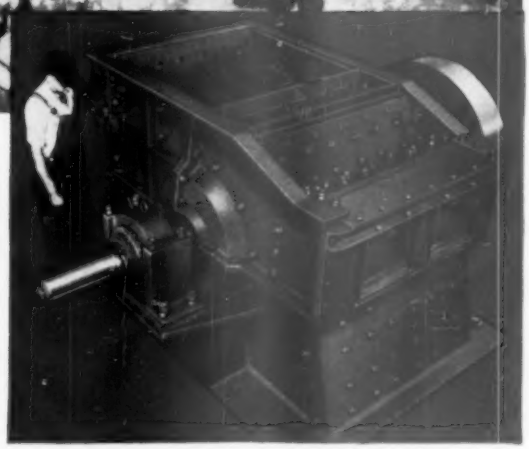
ANNUAL REVIEW and DIRECTORY ISSUE





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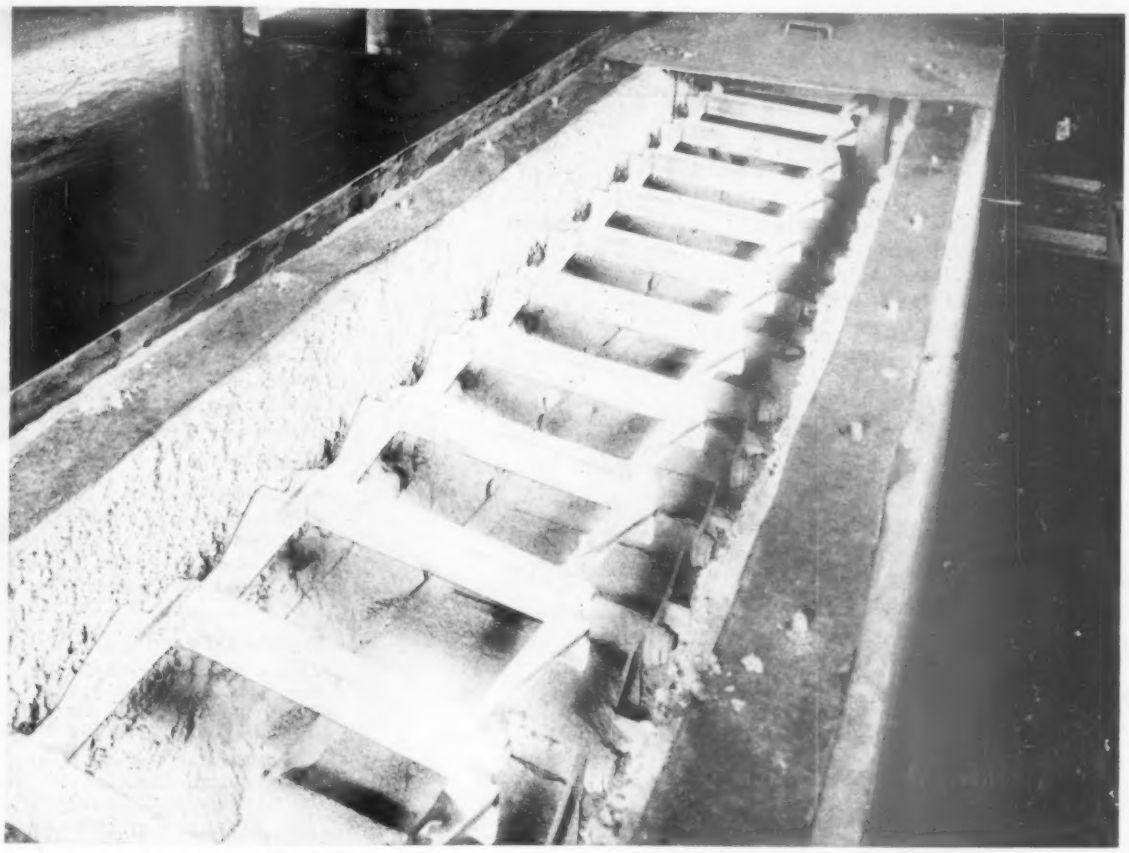

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JANUARY, 1952

ROCK PRODUCTS

THE INDUSTRY'S RECOGNIZED AUTHORITY

VOL. 55, No. 1

Bror Nordberg
Editor

Nathan C. Rockwood
Editorial Consultant

This Month

We Hear 67

Editorial—Profit Incentives to Challenge Productive Ingenuity 77

Rocky's Notes—Better Use of Federal Tax Money 79

Labor Relations Trends 81

People in the News 83

Industry News 87

Hints and Helps 90

New Machinery 92

Aggregates Industries to Maintain High Production Rate 96
Emphasis this year to be on cost reduction to improve profit ratio
Bror Nordberg

Progress in Cement Manufacture 110
Bror Nordberg

Quality Stressed by Aggregates Producers in Plant Operations 122
Walter B. Lenhart

Cement Industry Set to Meet 1952 Requirements 131
Decentralization of plants, new capacity and more continuous production from existing mills should combine to meet any normal demands
Bror Nordberg

Elements of Efficiency in Lime Calcination 137
Irving Warner

Penn-Dixie's 500-ft. Rotary Kiln 140
Bror Nordberg

Economic Contributions of the Seismograph to the Quarry Industry 148
Jules E. Jenkins

Developments in Gypsum Manufacture 152
Walter B. Lenhart

Recording Dust Collector Performance 157
Warren Walker, Jr.

Portable Plants' Role in Aggregates Production 161
Walter B. Lenhart

Nodulizing Stack Dust for Kiln Feed 164
P. S. Hass

Application of Flotation and Other Separatory Practices to Nonmetallics 167
James A. Barr, Jr.

Slag Producers Review Year's Activities 170

Convention Programs of Aggregates Industries 173

Postwar Developments in the Concrete Masonry Industry 223
Hubert C. Persons

Ready-Mixed Concrete Producers' Dilemma 229
E. L. Howard

Applying Basic Engineering Principles to Concrete Unit Manufacture 232
M. W. Loving

Producers Report Record Sales 237
Concrete products and ready-mixed concrete producers feel competitive forces.
Bror Nordberg

Vacuum Processed Lime Putty 240
Bror Nordberg

Lightweight Aggregates for Concrete Masonry 242
S. Carl Smithwick

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To Subscribers—Date on wrapper indicates issue with which your subscription expires. . . In writing to have address changed, give old as well as new address.

"WE HEAR..."

January, 1952

It has been reported by the Bureau of Mines that new discoveries of uranium have been made in the San Juan Mountains of southwest Colorado. The uranium occurrences are in rock formations of several geologic ages. The uranium was found in small pieces of "high-grade silver ore" on the mine dumps; smaller quantities also were found in lower-grade ore. In some mines, uranium-bearing minerals were found in place in small veins. None of the finds has been proved of immediate interest for commercial production but are significant in that they disclose a new area that is a potential source of radioactive material.

* * * * * * * * * *

The construction of 500,000 new classrooms by 1960 has been recommended by the Federal Committee of Education. The National Educational Association has revealed that 37 of the 48 states report large rural elementary school shortages, with 47 states reporting similar shortages in urban elementary schools. A New York Times survey revealed that 1,838,990 out of a total rural school enrollment of 12,500,000 pupils will suffer an impairment of education because of inadequate buildings. Between 1953-1955, these shortages will have reached the high schools. The deficit of classrooms is due to two main reasons--too few schools were built during World War II and the depression years preceding, and a jump in war and post-war births. School construction in 1951 is running about 10 percent ahead of that of 1950.

* * * * * * * * * *

Growth in the electrical industry has advanced rapidly in the last few years. According to figures from a news release by Westinghouse Electric Corp., installed generating capacity increased from about 13,000,000 kw. in 1920 to 75,000,000 kw. in 1951. In the same period, generated killowatt-hours increased from 40 to 360 billion. By 1961, it is expected that the installed generating capacity will reach 140,000,000 kw., and the annual rate of generation will be over 600 billion kw.-hr.

* * * * * * * * * *

Building units composed of autoclaved mixtures of granulated slag and pulverized quicklime are now being commercially produced in the Midwest, according to a recent report. A southern building material producer is also reported to be interested in this new masonry product.

* * * * * * * * * *

An amount of $518,217,713 has been authorized for the flood control and river and harbor improvement program assigned to the Corps of Engineers, of which $316,544,100 is allotted for general flood control projects, and $192,657,613 for river and harbor improvements. Funds for flood control on the Mississippi river and tributaries and emergency flood control allotments totaled $72,000,000.

* * * * * * * * * *

The city engineer of Columbus, Ohio, has stated that buses cause an estimated $136,000 worth of damage to the city's streets annually. According to a survey, taxpayers paid $92,905 in 1949 and $46,352 in 1950 for repair bills for thorough-fares over which trolley coaches run.

* * * * * * * * * *

Four different types of sulfite pulp mill by-products are being tested jointly by four paper companies, a Wisconsin research organization and Outagamie county, Wis., road authorities, for possible use as road-binder materials. These treatments are being applied to four adjoining stretches of road which have identical construction and surface.

WE HEAR

Heavy construction awards totaled $12,766,200,000 for the first 48 weeks of 1951, which was 17 percent higher than corresponding contract awards for the same period in 1950, as reported by Engineering News-Record. Awards for public construction amounted to $5,840,200,000, or 27 percent over the same period a year ago, while awards for private construction totaled $6,936,000,000, 10 percent above the comparable 1950 period. Industrial construction awards for the 48 weeks totaled $3,864,600,000, an increase of 152 percent over the previous year.

* * * * * * * * *

The U.S. Bureau of Reclamation plans to present to Congress shortly a bill authorizing construction of the Hells Canyon dam across the Snake river in Idaho, according to Pacific Road Builder and Engineering Review. If the bill is approved, the bureau plans to ask for $8,000,000 to start work on the $400,000,000 power and irrigation project.

* * * * * * * * *

The nation's output of goods and services will reach a new high in 1952, according to a poll conducted by F. W. Dodge Corp. The economists participating in the poll represent all regions; 69 are in the fields of business, private finance or private economic services; 48 are university instructors; and 11 are in government. A continuous rise throughout 1952 in total output of goods and services is expected by 94 of the economists, while 34 expect a declining trend during the latter part of the year. The average of all estimates indicates an annual output rate of $334.3 billion in the fourth quarter of 1951, compared with a predicted $348.6 billion for the fourth quarter of 1952. Government estimates for the third quarter of 1951 were $328 billion.

* * * * * * * * *

The Federal Housing Administrator has predicted that the government will permit new dwelling construction of 800,000-850,000 units next year, which is about the same limit as was set for 1951. He warned that if home building drops too low, inflation of dwelling prices will result.

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The Pennsylvania Railroad Co. recently reported that its program, undertaken in the summer of 1950, to build and rehabilitate 60,000 freight cars is over 90 percent completed. Approximately 54,000 cars have been placed in service. The program involves the expenditure of about $223,000,000. An additional $276,100,000 is being spent for new diesel-electric power. The added freight cars will increase the road's hauling capacity by over 62,000,000 tons annually. Of the 20,250 new freight cars already ordered, about 14,500 new gondolas, box and flat cars have been delivered thus far and, in addition, the company has built 6600 new cars in its shops. About 33,000 rehabilitated box cars, gondolas and hopper cars have been put back into service.

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A $1408 damage suit was filed recently by the Omaha Public Power District, against a sand and gravel company. According to O.P.P.D.'s petition, operations at the gravel deposit caused an electric substation and metering equipment to topple into the water, ruining most of the equipment.

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THE EDITORS

Editorial

Profit Incentives to Challenge Productive Ingenuity

THIS JANUARY ISSUE of ROCK PRODUCTS, in contrast with past annual reviews of industry developments, does not give greatest stress to business conditions and predictions. Rather, we emphasize and suggest developments to aid in meeting the principal problems confronting the rock products and concrete products industries.

Letters from producers summarized in this issue bear out that the year ahead holds many uncertainties. The one thing brought out with certainty in these letters is that continued increasing costs of operation and higher taxes on corporate incomes are threatening profits more than any time since World War II ended. For many companies this comes at a time when competitive forces have set in to impose additional pressure on the high-cost producer.

The solution to the profit squeeze lies in reducing operating costs or, for some, in increased volume of sales. Accordingly, most of this issue is geared to suggest what is being done and what is required to meet this challenge and to overcome other obstacles to profitable operation.

Accomplishments in Production

In the portland cement industry the approach continues to be in cutting unit costs per barrel of cement, as we point out in a special article covering progress in cement manufacture. Substantial savings have been accomplished, particularly in fuel costs and labor, which have enabled the industry to sell a better product at a price that compares favorably with past performance. The cement industry's ability to hold the price line is a tribute to production ingenuity and a testimonial to the economies of high capacity, mechanized operations. Through more continuous production, with larger machinery units, and better utilization of labor, man-hours per unit of production in 1950 had been decreased 23.5 percent since 1939, according to indices of the Bureau of Labor Statistics. Since 1945 the reduction was 31 percent in man-hours, which spans the period of years during which the industry invested most heavily in plant expansion and modernization.

Similar but less spectacular improvements in unit costs have been attained by the aggregates industries but theirs is a product not so standardized, and the emphasis is on plant operations that will enable the production, from all sorts of deposits, to meet high standards for quality.

As deposits of high grade sand and gravel and, to a lesser degree, stone and certain other nonmetallic minerals become scarcer, the notable progress made is in product improvement and beneficiation as we point out in this issue. Processing to prolong the reserves of materials and permit balanced and high volume production from deposits that otherwise might be questioned as to their suitability for meeting strict specifications will continue to be an increasingly important requirement for profitable operation.

Greatest opportunities for savings in unit costs seem to be in the exploitation of deposits before processing. Sand and gravel producers have the problem of selection of materials to minimize unsalable "waste" materials which are expensive to handle. Producers of crushed stone have opportunities to improve blasting techniques as suggested by an article in this issue.

Percentage Depletion

The granting of percentage depletion allowances, of 5 percent for sand and gravel and commercial crushed stone, and as high as 15 percent for chemical grade stone, in an amendment to the Revenue Act of 1951, was an outstanding development of 1951 and should provide these industries with an added incentive to hold down their costs.

The amendment permits a special deduction in computing net income, in recognition that deposits of sand and gravel and stone are expendable. A percentage of "gross income from the property," 5, 10 or 15 percent, whichever applies, is deductible but limited not to exceed 50 percent of net income before allowances for depletion.

This allowance will go far toward offsetting the adverse effects of increased corporate taxes for these industries, and thus provide more funds for exploration and for re-investment to attain greater efficiency in order to protect profits. Should a producer have a high cost operation with low net income in relation to gross income from the property he could well lose a substantial part of the depletion benefits available to him.

Full benefits and favorable competitive position as well are attainable if suitable deposits be operated in connection with efficient plants. An Ohio producer of sand and gravel emphasized what can be done by reporting *increased profits from decreased volume* of sales in 1951. He substituted a good deposit for one heavy in pea gravel and sand which constituted a high cost operation and he built a modern plant on the new deposit.

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Bror Nordberg

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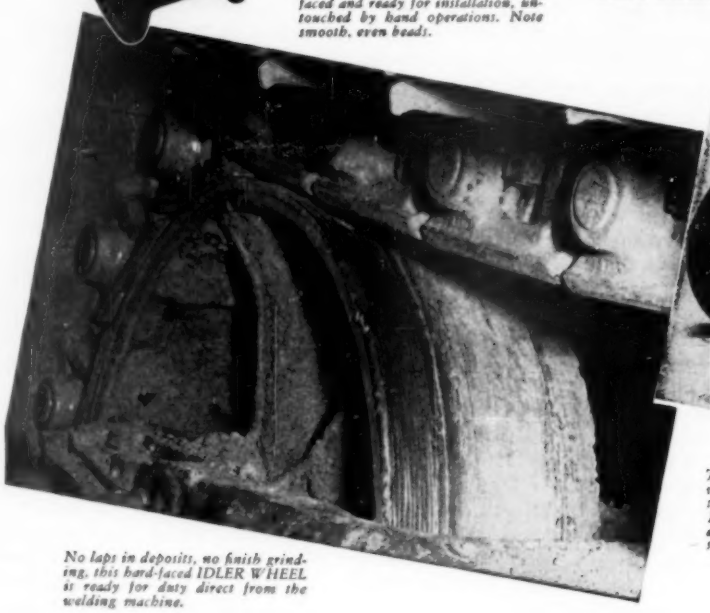

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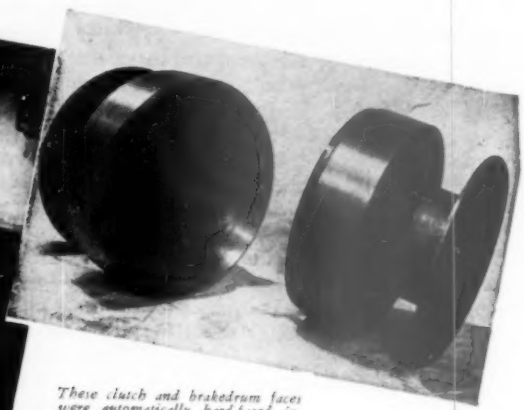

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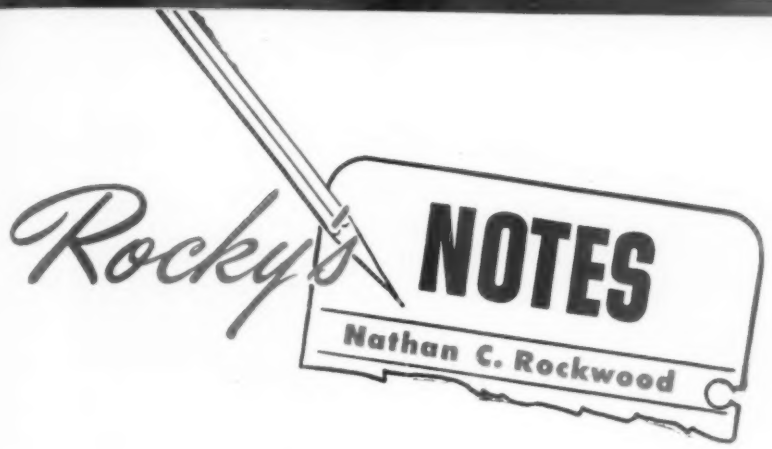


Better Use of Federal Tax Money

HOW CAN THE FEDERAL GOVERNMENT be kept from ultimate financial disaster? Probably there is hardly a business man who does not give this problem some thought. It looks now that not much voluntary help can be expected from the present government itself. And probably all of us realize without being constantly reminded, that we live in times when extraordinary expense for some government functions can hardly be avoided. To prevent ultimate bankruptcy that all other nations in history have suffered after long continued spending beyond income, debasing of currency, and political demoralization, every business man knows that a government must operate on a balanced budget. True, that doesn't have to be done every year, but it must average out that way. However, there has been no averaging out in the last 23 years, since in only two or three of those years has there been even a small excess of income over spending, and many years of big deficits. The next session of the Congress, it is said, will be asked to increase the present national debt limit of 275 billion dollars to 300 billion, which is $2000 per capita for every man, woman and child in the country.

The President of the United States has said it is impossible to make any cuts in government outgo. It is obvious that to the party in power a federal payroll of over 2,000,000 civil employes is advantageous. To cut government expenses may mean to cut partisan voters off the payroll. Yet cutting must be done since we have just about reached the limit of taxation.

Secretary Sawyer on Economy

The only member of the President's cabinet or of his advisors who seems to have the courage to take a sane view of government waste is Charles Sawyer, secretary of commerce, who makes many speeches that no one seems to pay much attention to, unfortunately. We have a release entitled "Government Economy; Its Prospects and Possibilities," being a speech delivered to the annual advertising and sales promotion conference of the Ohio State University, at Columbus, Ohio, October 19, 1951. There are many points in this address that we think could be used by men of industry in making suggestions to their representatives in Congress. What follows are little more than excerpts, in the Secretary's own language, which we trust fairly represent his sentiments even though removed from some of their context.

When the head of a government department suggests or demands that a bureau chief under him operate within a budget and wind up with a surplus, if possible, the bureau chief answers that if he shows a surplus he gives the Congress the impression that the original request was excessive and the agency head a poor administrator. Instead of being rewarded for his success in economy he fears he will be penalized by reduced appropriations the following year. That has gone on so far that toward the close of the fiscal year (June 30) if a surplus in any particular account is found to exist, extraordinary efforts are made to discover ways to spend it.

The head of an agency should be able to feel that what he accomplishes in economical operation brings some reward to his particular agency. *We need a recognition of the value of incentive.* We must devise and make effective *incentives* for *saving* the taxpayer's money, instead of *incentives* for *spending* it. If he could spend as he chose on agency activities even a part of the money he had saved, it would be a powerful incentive for economy.

An inherent weakness in the present federal budget system is the tendency of the Congress to make separate appropriations for separate functions in a single department. It would be helpful if the Congress were to make the several appropriations now allotted separately to the various bureaus and divisions, to the head of a department, so that as a matter of operation within his over-all budget, he could see that the money was spent in the best possible manner.

Control of Employes

Since the department head and the bureau chief do not at present receive credit for savings made, they have no great incentive to retain or encourage the more efficient employes and to get rid of the opposite kind. In an effort to protect the civil servant and remedy the evils of the so-called "spoils system" we have created a body of practices, precedents and laws which tend to treat employes as automatic units or robots and do not adequately recognize the difference in quality of service that employes render. We should make a more determined effort than so far has been made to distinguish between a person's real qualifications and a paper record of achievements, and to reward those who are efficient and get rid of, or at least not promote, those who are second rate.

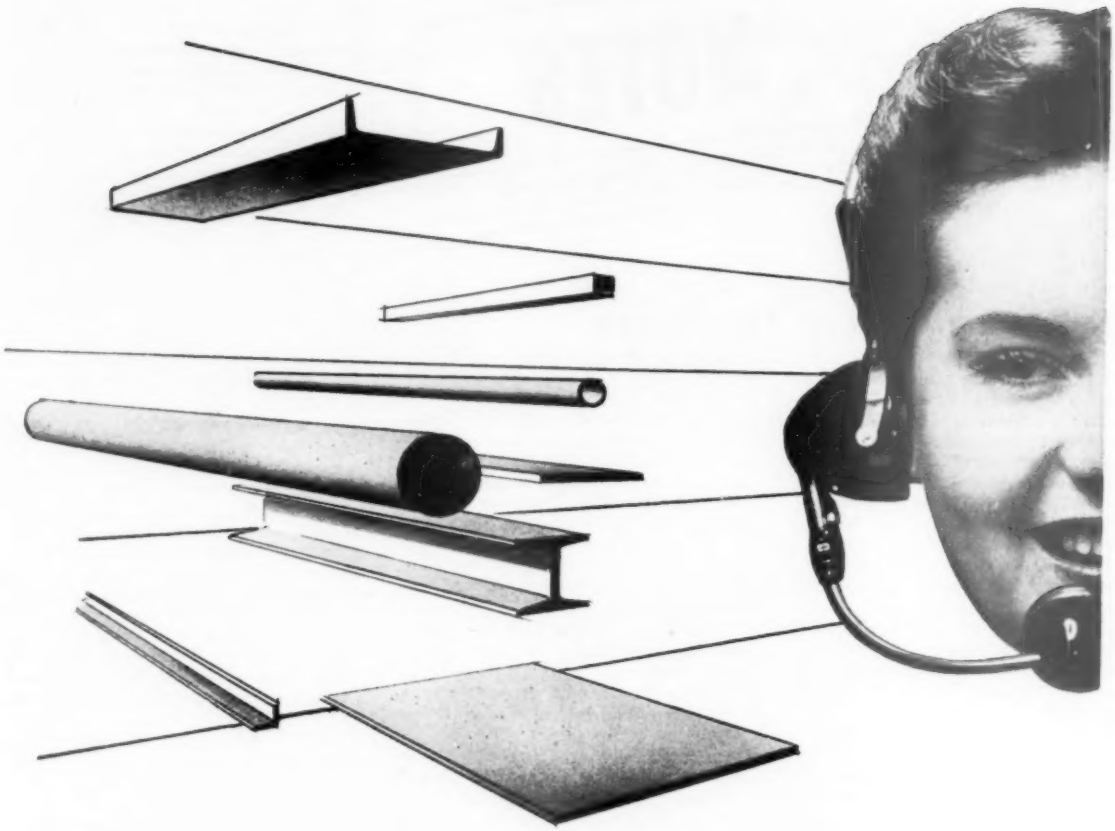
In connection with the budgets which are presented periodically to the heads of departments, one of the always recurring items is "within grade salary increases." This means in effect that automatically, since now almost all employes are rated "satisfactory," the employe gets an increase in salary. Almost no supervisor will face the risk of time and effort necessary to prove an "unsatisfactory" rating, or make the decision which would prevent the automatic raise. It should be easier than at present to eliminate incompetents. An American citizen has certain inalienable rights, but guaranteed employment by the federal government is not one of them.

Impossible "to Fire"

Every agency head has learned over the years that every effort to remove an employe is fraught with a most annoying and disappointing, if not disastrous, result. Frequently the trial of an employe for incompetence results instead in the trial of the agency head for prejudice and intolerance or worse. Many an agency head has finally come to the conclusion that he will leave incompetents on the payroll rather than go through the unpleasant ordeal of trying to get rid of them. Having learned his lesson, he gives up his attempt to crash through all the maze of procedures and gradations which have been established, and moves unenthusiastically with the current.

* * *

There is much more interesting detail in Mr. Sawyer's speech, but we have given enough here to illustrate why so much of our own hard-earned money is wasted in the federal government operations. So far as the federal government being able to live within an over-all budget is concerned, Mr. Sawyer says the solution is drastic but simple. "It is embodied," he said, "in the statement that there is a limit to what we can do."



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LABOR RELATIONS TRENDS

Eric Johnston's Philosophy on Wage Stabilization

By NATHAN C. ROCKWOOD

WHEN THE ECONOMIC STABILIZATION Administrator, Eric Johnston, quit on November 29 he turned over to his successor a "terminal report" which describes in considerable detail the philosophy which has guided his decisions and acts. Rumor has it that he was against such a general increase in the wage level as demanded by the C.I.O. steel workers' union, and that when he was told by the union bosses such an increase had already been promised them by the President of the United States, he would not believe it until confirmed personally by the President. Whether that is true or not our readers will probably know by the time this article is published and the President has let his decision be known.

We believe any discerning reader can find between the lines of Mr. Johnston's report substantial reasons why he would have held the line at somewhere near the present point, if we expect ever to be able to hold it at all. While his report, entitled "Strong Dollars" deals largely with the role of wage stabilization, it is obvious that he is fully aware that this alone is not the answer to our economic problems. He writes: "For long-range economic safety, we must depend primarily on improved production and distribution methods and in strengthened fiscal and monetary policies." In his philosophy, as outlined in this report, general wage and salary increases are justified by savings in production and distribution costs and to catch up with prior increases in the cost-of-living. They are not justified when they are designed to outdo some other group in labor or to make good increased income tax deductions from the pay envelope.

Wage Stabilization

According to Mr. Johnston, "What happens to the price level depends to a great extent on what happens in two areas where wage levels are exceedingly important—if not controlling—factors. These are: (a) the costs of production; (b) consumer purchasing power. Unrestricted wage increases in a man-power-short defense economy could raise production costs and purchasing power so high that reasonable, stable price ceilings could not hold long against the impact of inflation. Higher prices in turn would mean more wage demands—a merry-go-round of prices, wages, costs in a full-blown inflation spiral."

What Mr. Johnston apparently does not say or recognize is that constantly higher wages for a few groups of organized labor *do not* increase the purchasing power of the majority of consumers, or the over-all purchasing power of the nation, and do increase the purchasing power of the successful group only temporarily, and at the expense of every other group.

After describing the effects of a lack of wage control in the unrestricted competition of employers for man-power needs, and the unrestricted competition between labor unions to catch up or pass one another in wage scales and other benefits, Mr. Johnston states his objections to a genuine wage freeze as follows: "Just as price stabilization does not mean a rigid freeze of all prices, so wage stabilization does not mean a rigid freeze of all wages—and for much the same reasons. These reasons not only relate to production needs—they also involve basic principles of fairness and equity." He then explains that a freeze in wages, as of prices, would "wreck the dynamic flexibility characteristic of our economy;" "completely destroy collective bargaining," would "perpetuate gross inequities among our workers," and would "prevent the largest part of our population from sharing the benefits of our increased production."

It would seem that Mr. Johnston is a bit mixed up here, probably by too close contact with union bosses. It is at least debatable whether there are not more and greater "gross inequities" created by advancing the wages of a few aggressive groups at the expense of the buying power of other groups whose wages or incomes can not be advanced. Certainly it is "a gross inequity" to thrifty people who have accumulated savings and pensions for their old age to deprive them of the purchasing power of their incomes, especially since they no longer have any way of increasing these incomes. It is questionable too, whether "the largest part of population" is represented by members of a few strong labor unions. It is hard to see why collective bargaining would be "completely destroyed" by a temporary wage freeze at least until a sound economy for the country itself could be firmly re-established. But Mr. Johnston did not say these things and we read his arguments rather as justification of what he has done rather than as providing the President with arguments to keep up the process *ad infinitum*.

Wage Freeze Experience

Mr. Johnston explains why the original wage freeze order was not a freeze at all: "Millions of workers are covered by collective bargaining agreements customarily extending for periods of a year or more. Contracts negotiated during the first half of 1950 had, in most cases, provided for only moderate wage increases following the mild 1949 recession. By the latter half of the year, however, prices were going up so fast that new wage contracts carried increasingly greater wage increases. By December and early January, with the storm of inflation beating down on the economy, many workers were getting substantial boosts in wages to keep them abreast of—or to get them ahead of—increases in living costs.

"When the wage freeze was imposed, there was no way the workers left behind in the rush for higher wage rates could catch up to those who had held their own in the face of rising prices.

"Therefore, one of the first jobs tackled by the Wage Stabilization Board after the freeze was to settle on a fair catch-up formula for those workers whose wages were still geared to pre-Korean living costs. The three industry members and three public members of the nine-member tri-partite board cast a majority vote for a policy permitting all wage rates to go up 10 percent above the levels in effect on January 15, 1950. This was only slightly above the rise in the cost of living from January, 1950, to January, 1951.

"Under the terms of the formula, employers and employes could still bargain for increases over the permissive 10 percent limit, but such contracts had to be justified by special circumstances and required specific board approval.

"The 10 percent formula has sometimes been referred to as the wage 'ceiling' and as *the* wage policy. This is not correct. It was actually only a first step in the development of a broad wage stabilization program designed to meet the complex needs of our economy."

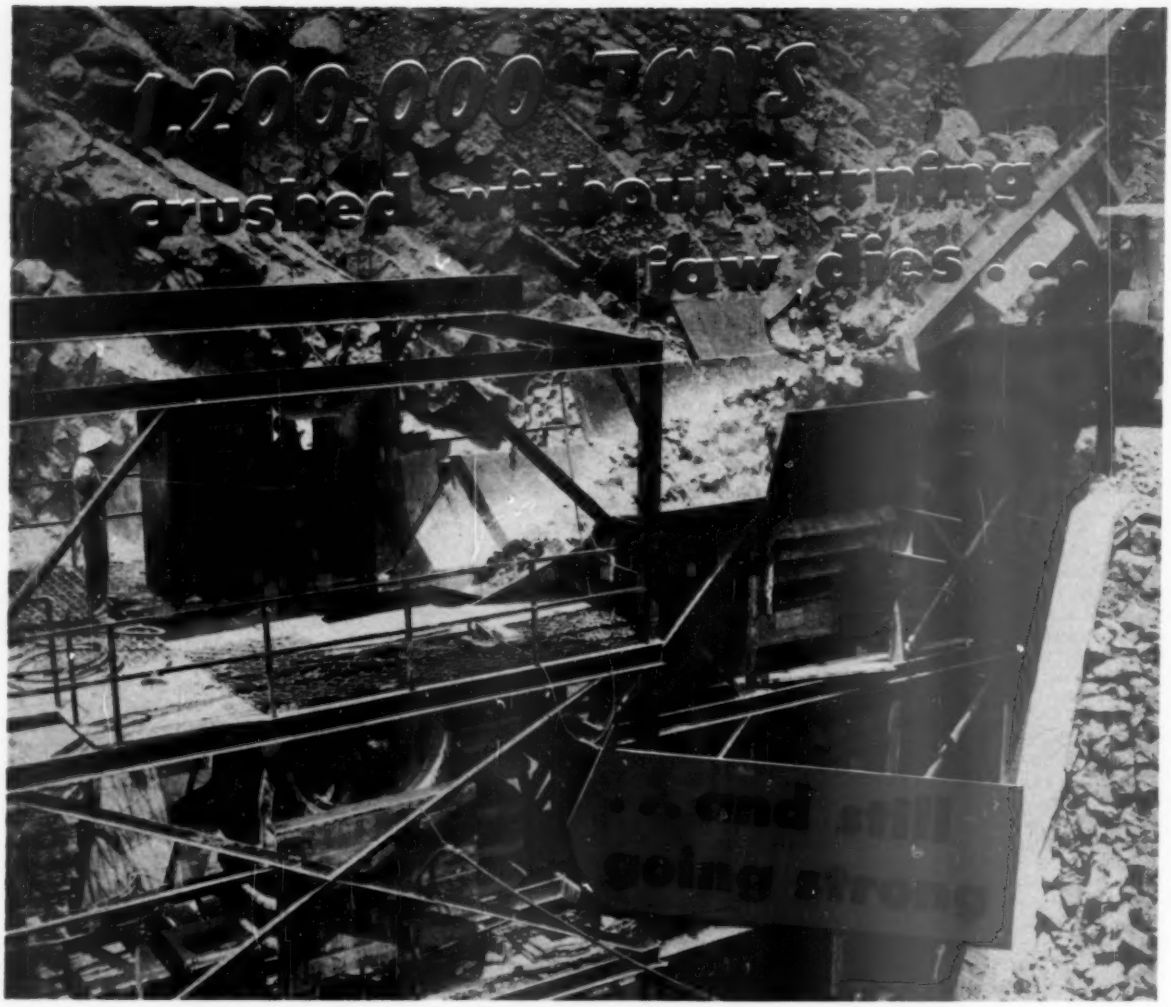
* * *

"There were a number of long-term wage agreements which provided that wage levels would regularly be adjusted to reflect two things: (a) changes in consumers' prices—up or down; (b) advances in productivity at a rate approximately equal to the long-term rate of increased output of the American economy as a whole.

"These factors have long been implicit in our collective bargaining practices even though they had not been generally applied in exact terms. Traditionally, wage rate adjustments have reflected living costs and a steady boost in real wages as our national productivity increased.

"So far there has been no compelling necessity to interfere with the continued operation of contracts of this type which went into effect before wage controls were imposed. Allowing labor and management to adjust wages periodically on the basis of actual increases or decreases in living costs is no more than fair. It enables workers to maintain their customary status in the economy. Allowing a further adjustment for increased productivity is not inflationary if the in-

(Continued on page 192)



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NEW LIPPMANN

PEOPLE in the news

Public Relations Manager

FRANK D. DAVIS has been appointed public relations manager of National Gypsum Co., Buffalo, N. Y., succeeding David A. White, Jr., who is on active duty with the U. S. Air Force. Mr. Davis was formerly public relations director for Davis and Elkins College, Elkins, W. Va. He is a graduate of Dartmouth College and a veteran of five years of service with the U. S. Army during World War II. Capt. White, presently located in Washington, D. C., was regional director of public relations for the Veterans Administration in Buffalo before joining National Gypsum Co. in 1948.

Service Engineer

ROBERT K. DUEY has been appointed service engineer for Southern Lightweight Aggregate Corp., Richmond, Va. A civil engineer, Mr. Duey has been engaged in the concrete business for a number of years. During World War II he was an officer in the Civil Engineering Corps of the U. S. Navy, serving 18 months in the Southwest Pacific. He is a native of Pennsylvania and received his engineering degree from Carnegie Institute of Technology.

Elected Vice-Presidents

GEORGE T. LATIMER has been elected vice-president in charge of operations of Waukesha Lime and Stone Co., Waukesha, Wis. He had been superintendent for a number of years and was formerly associated with Material Service Corp., Chicago, Ill. Edward B. Hill, who has served as sales manager for the past two years, has been named vice-president in charge of sales. His former connection was with The Carbon Limestone Co., Hillsville, Penn.

Joins Concrete Firm

CHARLES J. FRENCH, JR., has resigned as assistant engineer of the National Concrete Masonry Association, Chicago, Ill., to accept a position with Cleveland Builders Supply Co., Cleveland, Ohio. While on the N.C.M.A. staff, Mr. French was actively engaged in the technical problems of the concrete masonry industry. Under the guidance of R. E. Copeland, director of engineering, he has prepared a number of construction details and designs, some of which have appeared in technical reports. He presented a paper entitled "Some Applications of Reinforced Concrete Masonry" at the last annual convention of the National Concrete Masonry Association in Cleveland, Ohio.

Executive Sales Engineer

THOMAS C. MILLER, formerly supervisor of the masonry materials, ceramics and minerals department of Armour Research Foundation, Illinois Institute of Technology, Chicago, Ill.,

Thomas C. Miller

has been appointed executive sales engineer in the industrial division of National Gypsum Co., Buffalo, N. Y. Mr. Miller, who has had 20 years of experience in the lime and portland cement industries, will concentrate on the company's lime activities. He has had extensive experience in the design, construction and operation of shaft lime kilns and in the production of chemical lime for specific purposes as well as in the manufacture of high calcium and dolomitic finishing and masonry mortar limes. He also has had experience in the development of lightweight concrete aggregates from clay and shales. An article by Mr. Miller on the "Production of Lightweight Aggregate" appeared in the October, 1950, issue of ROCK PRODUCTS, p. 104. Born in Sherwood, Tenn., Mr. Miller studied at the University of Tennessee and the University of the South. He is a member of the American Concrete Institute and the American Chemical Society.

Sales Representative

DON GRIFFIN has been appointed sales-service representative for Wamix, Inc., Dallas, Texas. A graduate of North Texas State College, Mr. Griffin was formerly associated with the Texas Contractor, a construction magazine published in Dallas. Tom Amis is president of Wamix, Inc.

Vice-President Resigns

E. W. CAREY has resigned as vice-president and director of personnel of United States Gypsum Co., Chicago, Ill. After serving as general credit manager and controller, Mr. Carey spent 14 years in the sales division as district sales manager, division sales manager and general dealer sales manager, with supervision of all sales offices. He was appointed director of personnel in 1948 and was elected a vice-president in 1949.

Bureau of Mines Chiefs

CHARLES W. MERRILL, chief of the Base Metals Branch, Minerals Division, Bureau of Mines, Washington, D. C., has been appointed assistant chief of the Minerals Division, of which Lowell B. Moon is the chief. Charles H. Johnson has succeeded him as chief of the Base Metals Branch. Waldemar F. Dietrich, formerly chief of the Rare and Precious Metals Branch, has been named chief of the Ceramics and Fertilizer Materials Branch, while Richard H. Mote succeeds him as chief of the Rare and Precious Metals Branch. Helena M. Meyer has been appointed assistant chief of the Base Metals Branch.

Committee Chairman

MELVIN H. BAKER, president of National Gypsum Co., Buffalo, N. Y., has been elected chairman of the board of directors of the Buffalo Redevelopment Committee, Inc., organized to promote use of private capital for redevelopment of substandard housing areas in the city.

Sales Manager

JACK KELLY, formerly Philadelphia industrial sales representative for National Gypsum Co., Buffalo, N. Y., has been appointed sales manager of lime and limestone products in the industrial division. A native of Pennsylvania, Mr. Kelly graduated from St. Joseph's College in 1934, having majored in business administration. He has been with the firm since 1948.

George H. Reiter

Fred T. Wiggins

Donald C. Leo

Universal Appointments

GEORGE H. REITER has been elected executive vice-president of Universal Atlas Cement Co., New York, N. Y. He was formerly vice-president and general sales manager and will be succeeded in this position by Fred T. Wiggins, who has been serving as vice-president and assistant general sales manager. Charles B. Baker, formerly assistant to the president and secretary, has been appointed vice-president and general attorney. Donald C. Leo has been named secretary, and Edward D. Depew, assistant secretary.

Charles B. Baker

Mr. Reiter joined the company in 1912 as engineer in the Cement Information and Inspection Bureau, Chicago, Ill., leaving in 1915 to become manager of the Illinois Paving Brick Manufacturers' Association. Five years later he became secretary and then president of Springfield Paving Brick Co. In 1930, Mr. Reiter was appointed manager of The Cement Institute in Chicago. A year later, he joined Missouri Portland Cement Co., St. Louis, Mo., as sales manager. From 1933 to 1937, he was manager of the Chicago division and secretary and general manager of The Cement Institute, Chicago and Washington. He also served as secretary and later as chairman of the NRA-National Code Authority for the portland cement industry. Mr. Reiter returned to Universal Atlas Cement Co. at Chicago in 1937 as assistant to the vice-president and later in the same year was elected vice-president and general sales manager. He was elected a director in 1941.

Mr. Wiggins has been associated with the company for 25 years, joining the firm in 1926 at Birmingham and serving in various capacities in the sales department until 1934, when he was appointed sales manager of the Birmingham territory. In 1944, he became assistant to the vice-president of sales, Western region, Chicago. He was elected vice-president and assistant general sales manager in 1949.

Mr. Baker joined the company in 1942 and became secretary and general attorney in 1943. He was elected a director in 1944 and five years later was appointed assistant to the president. He was formerly associated with division counsel for U. S. Steel Corp. in Chicago.

Mr. Leo started with the company as an attorney in 1943 and was made assistant secretary in 1947. He was formerly associated in legal capacities with New York firms and operated his own law office.

Mr. Depew joined Universal Atlas in 1947 as attorney specializing in labor matters. Previously he had been employed by Western Electric Co. in industrial relations work.

Edward D. Depew

Silo Manufacturers Meet

NATIONAL ASSOCIATION OF SILO MANUFACTURERS, Norwich, N. Y., held its annual meeting November 26-27 in Chicago, at which time the 1952 officers and board of directors were elected. The new president is C. Boyd Ross, Marietta Concrete Corp., Baltimore, Md., vice-president is Ben F. Gurney, Madison Silo Co., Madison, Wis., and secretary-treasurer is Z. W. Craine, Craine, Inc., Norwich, N. Y. The board of directors is as follows: *Atlantic division*, William Henry, Grange Silo Co., Inc., Red Creek, N. Y.; Stewart Leonard, Harder Silo Co., Cobleskill, N. Y.; and Mrs. E. C. Schroeder, Economy Silo & Mfg. Co., Frederick, Md.; *Central division*, Henry Long, Long Silo & Block Co., Shelbyville, Ky.; Glenn V. Gladville, Michigan Silo Co., Massillon, Ohio; and F. Leonard Christy, Marietta Concrete Corp., Marietta, Ohio; *Southwestern division*, Chester Anderson, McPherson Concrete Products Co., McPherson, Kan.; Leon Dodson, The Dodson Mfg. Co., Inc., Wichita, Kan.; and Byron Radcliff, Interlocking Stave Silo Co., Wichita, Kan.; *Northwestern division*, Merrill Allen, Watertown Cement Products Co., Watertown, S. D.; Gordon Spry, Waterloo Concrete Co., Waterloo, Iowa, and Ernest Anderson, Wadena Silo Co., Wadena, Minn.

Elects Officers

EASTERN NEW YORK MINERAL AGGREGATES SAFETY COUNCIL, at its November meeting held in Albany, N. Y., elected its 1952 officers. These are: president, Seymour Fleming, New York Trap Rock Corp., Newburgh, N. Y.; vice-president, C. A. Gustafson, The Callanan Road Improvement Co., South Bethlehem, N. Y.; secretary, Clarence Stetser, New York Trap Rock Corp., New Hamburg, N. Y., and treasurer, C. J. O'Neill, North American Cement Co., Catskill, N. Y.

Dissolve Partnership

LAROY GARRISON has sold his interest in Garrison & Turner Rock Quarry and Limestone Co., Shelbina, Mo., to his partner, Franklin Turner. The company will now operate under the name of Turner Rock Quarry and Limestone Co.

OBITUARIES

STEPHEN J. KUBIAK, founder of S. J. Kubiak Concrete Products Co., Buffalo, N. Y., died suddenly at his home in Buffalo on November 13. Born in Poland, Mr. Kubiak came to the United States in 1890 and settled in Buffalo in 1906. He organized the concrete products concern in 1924.

CHARLES F. SMITH, president of Smith Engineering Works, Milwaukee, Wis., died December 10 at Pasadena, Calif., where he had gone for his winter vacation. He was 70 years old. Born in Wausau, Wis., Mr. Smith graduated from the University of Wisconsin and a few years later became vice-president and sales manager of the T. L. Smith Co., Milwaukee. In 1915, he was appointed president of the Smith Engineering Works. He was also a vice-president of the Sterling Wheelbarrow Co., West Allis, Wis. All three of these companies were founded by his father, Thomas L. Smith. Mr. Smith is survived by his wife, three sons, four daughters, a sister and two brothers, Irving R., president of the Sterling Wheelbarrow Co., and Harold E., president of the T. L. Smith Co. Two of his sons, Gerald L. and Thomas S., are active members of the Smith Engineering Works.

Charles F. Smith

CARLETON T. WEST, vice-president, purchasing agent and chief engineer of Monolith Portland Cement Co., Los Angeles, Calif., died on November 10. He was 52 years of age.

HARRY L. BERNO, president of Medusa Portland Cement Co., Cleveland, Ohio, died suddenly on November 23 at the Hotel Waldorf Astoria in New York, N. Y., where he and his wife had gone on a business and pleasure trip. He was 44 years old. Mr. Berno was a graduate of Ohio Wesleyan University, where he was an outstanding athlete and student. During World War II he served as chief of the Industry Branch of the Economic Division, Office of Military Government in Germany. Prior to entering military service, Mr. Berno had been president of the W. H. Davey Steel Co.

OTTO J. ELLINGEN, president of Conco Building Products, Inc., Mendota, Ill., passed away suddenly in Mendota, on November 8, at the age of 62. He was also president of the Conco-Meier Corp., and a vice-president of H. D. Conkey and Co., with which he had been associated for more than 40 years.

EDWARD J. DYKE, sales representative of The Celotex Corp. in the Chicago area for more than 25 years, passed away in St. Paul, Minn., on October 21. He joined the Chicago staff of The Celotex Corp. in 1924. About six months prior to his death he had been transferred to the Minneapolis branch.

JAMES H. MCKILLOP, a pioneer in the development of phosphate in Polk county, Fla., passed away in Winter Haven, Fla., on November 6. He was 85 years of age. As a young machinist and engineer, Mr. McKillop went to Polk county in 1886 and helped design and erect the machinery for the county's first phosphate plant at Homeland. He also planted some of the county's first citrus groves and was prominent in the development of truck crops in the Lake Eloise section.

JOSEPH J. RYAN, president and treasurer of the Ryan Ready Mixed Concrete Corp., New York, N. Y., died October 6. He was 65 years of age. Mr. Ryan was also president and treasurer of the N. Ryan Co., Inc., manufacturers and suppliers of concrete. Both concerns were founded by his father, Nicholas Ryan, who died in 1902.

MONTAGUE H. GRAHAM, vice-president of the Pacific Rock and Gravel Co., Monrovia, Calif., passed away November 6. Born in Toronto, Canada, Mr. Graham had been a resident of Monrovia for 46 years. He had been associated with the rock and gravel industry since 1912.

JAMES F. GARNEAU, president of the Victory Mica Corp., Brooklyn, N. Y., passed away October 16. He was also president of the James F. Garneau Co., Inc., New York, N. Y., importer of mica.

FRED C. HEDRICK, SR., president of the Jacksonville Concrete Co., Jacksonville, Fla., died October 23 following an illness of several months. He was 67 years of age. After graduating with highest honors from Trinity College, Hartford, Conn., Mr. Hedrick operated a ranch in Colorado for several years, then returned to Florida in 1908 to enter the concrete business.

JAMES H. CRAGGS, SR., president of the Williston Shell Rock Co., which operates limerock plant at Newberry, Fla., died suddenly on October 21 in Orangeburg, S. C. He was 59 years old. Mr. Craggs was also president of the James H. Craggs Construction Co. of Ocala and Gainesville, Fla.

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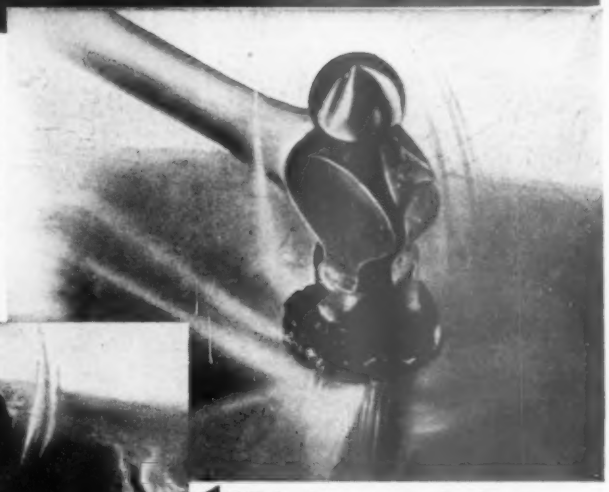

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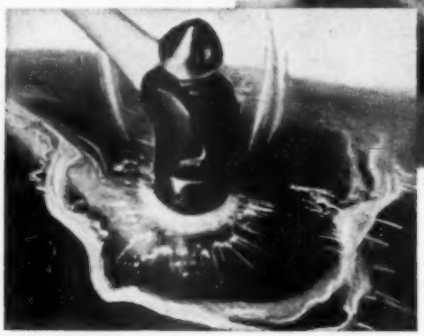

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TUNE IN . . . TEXACO STAR THEATER starring MILTON BERLE on television every Tuesday night. METROPOLITAN OPERA radio broadcasts every Saturday afternoon.

industry news

Bradley Transportation Co.'s new 666-ft. limestone carrier was side-launched at Manitowoc, Wis. on November 28. The 72-ft. beam self-unloading vessel will carry 20,000 tons of limestone on each trip from the quarry at Calcite, Mich., to U. S. Steel plants on the lower Great Lakes ports

Limestone Carrier Launched

THE SEVENTH LIMESTONE carrier to join the fleet of Bradley Transportation Co., Detroit, Mich., was launched November 28 at the shipyard of Manitowoc Shipbuilding Co., Manitowoc, Wis. The 666-ft. John G. Munson, largest vessel in the company's fleet, will carry 20,000 tons of stone each trip between Michigan Limestone and Chemical Co.'s quarry at Calcite, Mich., and U. S. Steel Corp. plants on the lower Great Lakes ports. Both Bradley and Michigan Limestone are subsidiaries of U. S. Steel. Irvin L. Clymer is president of the subsidiaries.

The ship was side launched, which is customary practice on the Great Lakes. Sponsor of the new vessel was Mrs. Munson, whose husband is a retired vice-president of U. S. Steel. The launching was witnessed by 10,000 people, including company officials and press representatives brought from Chicago on a special train. After the launching, a luncheon was held in the Manitowoc County Armory for the guests.

Fluorspar Production

CONSUMPTION OF FLUORSPAR in the United States in the third quarter of 1951 reached a total of 123,216 short tons, a gain of 1 percent over the preceding quarter and 0.9 percent greater than the previous high established in the first quarter of 1951, according to the Bureau of Mines. Usage of fluorspar at hydrofluoric acid plants was the largest since statistics were first kept in 1942. Production of acid-grade fluorspar was the highest since the first quarter of 1944. The flotation mill of Fluorspar Mines, Inc., near Forney, Idaho, made its initial production of acid-grade concentrates in the third quarter.

Production and shipments of fluorspar of domestic origin of all grades were 92,100 and 96,957 short tons, respectively, in the third quarter, an increase of 4 percent in each over the preceding quarter. Of the shipments of metallurgical-grade fluorspar in the third quarter, 48,612 tons were from Illinois and Kentucky and 5258 tons from Nevada, New Mexico and Utah. Imports of fluorspar in the third quarter totaled 27,688 tons, a drop of 39 percent from the preceding quarter.

Feldspar

DEZENDORF MARBLE CO., Austin, Texas, recently announced the discovery of an extensive deposit of feldspar on one of its leases in central Texas, and is mining and crushing it at its crushing plant at Austin. The larger size, $\frac{3}{8}$ in., is being sold for roofing granules, while the smaller sizes and dust are being used for potteries and glass manufacture. The company also plans to erect a fine-grinding plant using pebble mills. The flint pebbles used will be from the company's own flint-pebble deposits.

California Asbestos

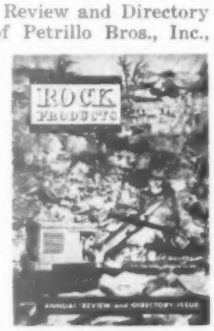
SMALL QUANTITIES of asbestos have been produced intermittently in California for many years, according to a report in *Mineral Information Service* of the California Division of Mines. Asbestos deposits in that state are contained mostly in massive serpentine formed by the alteration of magnesium-rich ultrabasic rocks. California production has been almost entirely of the chrysotile and tremolite varieties; one mine has produced crocidolite. Potential chrysotile-bearing rocks are widely distributed throughout the northern and coastal areas of California.

German Cement

WEST GERMAN CEMENT production for the first eight months of 1951 was estimated at 10 percent above the 1950 figures, with much of the production being exported. Total production in 1950 was approximately 10,800,000 tons, of which 1,500,000 was exported to 27 countries, including many Latin American countries and a small amount to the United States. The high quality of German cement and the industry's ability to offer relatively favorable delivery terms were said to be the chief reasons for Western Germany's reappearance in the world market, as was stated by Heinz A. Lessing, a director of the Alsenische Portland Cement Fabriken K. D. of Hamburg, who recently visited the United States to study production and supply methods.

Cover Picture

THE OPERATION SHOWN on the cover of this Annual Review and Directory Issue is that of Petrillo Bros., Inc., Wilmington, Del. Denny T. Petrillo is president and Charles A. Petrillo is secretary-treasurer. The Manitowoc Model 2000 Speedshovel is shown working in the trap rock quarry. The crushing plant has a capacity of 3000-4000 tons per week. In addition to crushed stone, the company also produces ready-mixed concrete. The photograph was taken by Manitowoc Engineering Works, a division of Manitowoc Shipbuilding Co.



Lawrence Merges With Dragon

LAWRENCE PORTLAND CEMENT CO., New York, N. Y., has merged with Dragon Cement Co., also of New York City. Dragon has assumed all of Lawrence's assets and liabilities and will have the same policies and personnel as Lawrence. The name "Lawrence" has been replaced by Dragon.

Federal Highway Appropriations

BUREAU OF PUBLIC ROADS, Department of Commerce, has published the apportionment of the $500,000,000 authorized as federal aid to the states for highways in the fiscal year beginning July 1, 1952. The funds were authorized by the Federal-Aid Highway Act approved September 7, 1950. The act provides $225,000,000 for projects on the federal-aid highway system, $150,000,000 for projects on the federal-aid secondary system, and $125,000,000 for projects on the federal-aid highway system in urban areas.

Funds will be expended under the supervision of the Bureau of Public Roads and according to the general procedure in use for many years in which state highway departments propose projects, prepare plans, award contracts, and supervise construction, all subject to federal approval. Federal participation is limited to half the cost except in the public-lands states where participation may be increased above 50 percent by one-half of the percentage of the area of the state that is public land.

Used Equipment Contest

FIRST MACHINERY CORP., New York, N. Y., has announced details of a $1500 prize contest open to any person connected with the chemical and allied industries. Awards of $100 a month for the best statement on the subject: "My Happiest Experience With Used Equipment" are offered for each month through October, 1952. All entries are to be sent to Contest Editor, First Machinery Corp., 157 Hudson St., New York 13, N. Y.

Mining Convention

INTERNATIONAL MINING DAYS celebration, sponsored by the El Paso, Texas, Chamber of Commerce, was held at El Paso, November 15-17, 1951. Activities included technical sessions, field trips, and many social activities.

Among papers presented at the technical sessions were: "Application of Freezing Method to Quicksand in Potash Fields," by R. Haworth, manager, and James Edmunds, chief engineer, Potash Company of America, Carlsbad, N. M.; "Shaft Sinking Through Water Bearing Zones," by J. E. Tong, mine superintendent, Duval Potash and Sulphur Co., Carlsbad, N. M.; "Modern Trends in Electric Equipment for Mine Hoisting Service," by G. W. Webb, mining application engineer, General Electric Co., Dallas, Texas.

Portland Cement Production

THE PORTLAND CEMENT industry produced 22,797,000 bbl. of finished cement in October, 1951, as reported to the Bureau of Mines. This was an increase of 1 percent compared with the output in October, 1950. Mill shipments totaled 26,140,000 bbl., an increase of 8 percent over the October, 1950, figure, while stocks were 17 percent above the total for the same month in 1950. Clinker production during October, 1951, amounted to 22,398,000 bbl., an increase of 5 percent compared with the corresponding month of the previous year. The output of finished cement during October, 1951, came from 153 plants located in 36 states and Puerto Rico. During the same month of the previous year, 22,461,000 bbl. were produced in 150 plants.

Coming Conventions

January 15-17, 1952—
National Agricultural Limestone Institute, Annual Convention, Hotel Statler, Washington, D. C.

January 16-17, 1952—
Wisconsin Concrete Products Association, 32nd Annual Convention, Plankinton House, Milwaukee, Wis.

January 21-24, 1952—
American Road Builders' Association, 50th Anniversary Meeting, Rice Hotel, Houston, Texas.

February 5-6, 1952—
Missouri Limestone Producers Association, 7th Annual Meeting, Hotel Governor, Jefferson City, Mo.

February 11-15, 1952—
National Sand and Gravel Association, 36th Annual Convention and Exhibit, Conrad Hilton Hotel, Chicago, Ill.

National Ready Mixed Concrete Association, 22nd Annual Convention and Exhibit, Conrad Hilton Hotel, Chicago, Ill.

February 18-20, 1952—
National Crushed Stone Association, 35th Annual Convention and Exhibit, Conrad Hilton Hotel, Chicago, Ill.

February 18-20, 1952—
National Concrete Masonry Association, Annual Convention, New Yorker Hotel, New York, N. Y.

February 18-21, 1952—
American Institute of Mining and Metallurgical Engineers, 79th Annual Meeting, Hotel Statler, New York, N. Y.

February 26-28, 1952—
American Concrete Institute, 48th Annual Convention, Netherland Plaza, Cincinnati, Ohio

February 27-28, 1952—
American Concrete Pressure Pipe Association, 3rd Annual Convention, Drake Hotel, Chicago, Ill.

February 28-29, 1952—
Autoclave Building Products Association, 46th Annual Convention, Roosevelt Hotel, New Orleans, La.

February 28-March 1, 1952
American Concrete Pipe Association, 44th Annual Convention, Drake Hotel, Chicago, Ill.

March 3-5, 1952—
American Concrete Agricultural Pipe Association, 2nd Annual Convention, Brown Palace Hotel, Denver, Colo.

March 5-6, 1952—
Iowa Agricultural Limestone Association, Inc., 7th Annual Convention, Savery Hotel, Des Moines, Iowa.

May 14-16, 1952—
National Industrial Sand Association, 17th Annual Meeting, The Homestead, Hot Springs, Va.

June 23-27, 1952—
American Society for Testing Materials, 50th Anniversary Meeting, Hotels Statler and New Yorker, New York, N. Y.

Equipment Distributors

ASSOCIATED EQUIPMENT DISTRIBUTORS, Chicago, Ill., reports that registrations for the 33rd annual meeting, scheduled for January 27-31 at the Conrad Hilton Hotel, Chicago (formerly The Stevens Hotel) have already passed last year's record-breaking total. Highlights of the four-day meeting include a sales executives clinic, the "Meet Your Manufacturers" session, a governmental problems meeting and a manufacturer-distributor problems session.

Employment of Minors

THE BUREAU OF LABOR STANDARDS recently issued a bulletin entitled, "Mining Other Than Coal," which concerns the hazards of various types of mining operations as related to the employment of minors. The bulletin covers quarries, clay pits and mines, sand and gravel operations, metal mines, and ore-dressing plants, and served as the basis for Hazardous-Occupations Order No. 9, which prohibits the employment of minors under 18 in occupations considered particularly hazardous for young workers or detrimental to their health or well-being. Single copies of the bulletin may be obtained without charge from the Bureau of Labor Standards, U. S. Department of Labor, Washington 25, D. C. Quantities may be purchased from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., at $0.25 per copy.

Monthly Lime Statistics

THE NATIONAL LIME ASSOCIATION has announced that the U. S. Bureau of Mines will henceforth compile and publish monthly statistics on lime shipments. The N.L.A. has previously performed this statistical service. The principal reason given for making this change was that greater industry participation could be achieved, with the resulting report being more comprehensive and accurate. It was also stated that governme..t defense agencies, like the D.P.A., N.P.A. and D.M.A., generally prefer government statistics when available in contrast to private industry figures. The N.L.A. urges all lime companies to participate in this new monthly lime statistical service as all individual figures will be treated in strict confidence and, the greater the response, the more valuable will be the report.

Armour Research Projects

ARMOUR RESEARCH FOUNDATION of Illinois Institute of Technology recently published a 56-page report, entitled "Fifteen Years of Research," listing and describing the various research projects carried on at the institute. Scientific progress on a wide variety of projects and an increase of one-third in volume of investment by sponsors are revealed in the report. The foundation is a non-endowed, nonprofit, scientific research organization, supported by industrial concerns and government agencies which contract for its services. A full-time staff of 856 persons undertook 332 projects during the past year.

Among the projects described in the report, of special interest to producers of rock products and concrete products, are: development of lightweight aggregate from Alton Brick Co. shale; development of lightweight concrete aggregate from shale and overburden on property of Fenati Brick Co.; development of lightweight concrete aggregate from Toronto clay; development of lightweight concrete aggregate from Utica-Lorraine shale; dolomite lime; lightweight concrete aggregate materials survey; utilization of loess for manufactured aggregate; utilization of water slag and fly ash; and vermiculite plaster.

"EVERY TIME SHE GOES BY, OUR TEMPERATURE RECORDERS START ACTING UP!"

This diesel-powered mobile crushing and screening plant, designed and built by W. S. Thomas and Taylor, Ltd., Johannesburg, South Africa, is destined for service in the Transvaal area of South Africa. The unit has a feed hopper with a 36- x 15-in. Grizzly roller-bearing jaw crusher powered by a 150-hp. diesel and a 25S gyratory crusher with a two-deck, 4- x 10-ft. vibrating screen and retractable and portable conveyors powered by a 200-hp. diesel. The engine in the Autocar tractor is a 165-hp. Cummins. The other diesel engines in the unit were also made by Cummins

Cement Expansion

IDEAL CEMENT CO., Denver, Colo., has announced that after the proposed reorganization and merger with Pacific Portland Cement Co. of San Francisco, Calif., has been completed, the properties of the Pacific company are to be improved and expanded to the extent of at least $6,500,000. Plans include expansion of facilities at Redwood City, Calif., at a cost of approximately $3,500,000, and rebuilding of the Gold Hill, Ore., plant, at an estimated cost of $3,000,000.

Ideal Cement Co. is now said to be the fourth largest cement company in the country, with sales of $34,700,000 in 1950. Since 1945, the company has expended some $32,000,000 on expansion.

Pavement Yardage

AWARDS OF CONCRETE pavement for the month of October and for the first ten months of 1951 are listed by the Portland Cement Association as follows:

	Sq. yd. awarded During October 1951	During first ten months 1951
Roads	803,175	20,910,294
Streets and alleys	1,777,446	20,936,999
Airports	275,451	12,979,019
Totals	2,856,072	54,826,312

Awards of concrete pavement for the month of November and for the first eleven months of 1951 are listed by the Portland Cement Association as follows:

	Sq. yd. awarded During November 1951	During first eleven months, 1951
Roads	1,814,195	22,724,489
Streets and alleys	1,271,295	22,208,294
Airports	671,142	13,650,161
Totals	3,756,632	58,582,944

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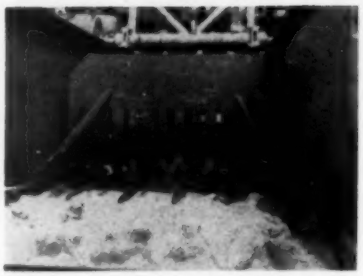


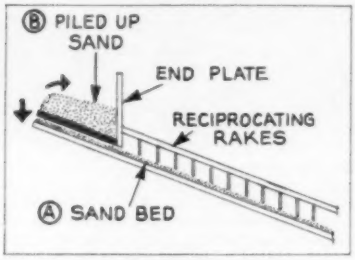
Bars welded to plate slice through sand, keeping it loose

Improving Dewatering Performance

SEVERAL TIMES in the past few years ROCK PRODUCTS has published data relating to methods of getting better dewatering in a rake-type dewatering unit. The essence of these schemes was to cut back the upper end of the rake mechanism about 30 in. and put an enlarged plate on the upper end of the rakes. The large plate is usually slotted. This facilitates drainage through the plate. In action, sand piles up in front of this buffer plate, holding the sand there about four times as long as is normally the case without such a design.

By referring to the line drawing, the piled-up sand is at B. Most of the water drainage is as indicated by the two arrows and appears to be almost vertical. However, to enable the vertical drainage to be more effective, the sand bed (shown at A) under the top rakes should be loose for, as most operators of rake dewaterers and classifiers know, the sand can become hard, dense and compacted.

One operator welded six ⅜- x 1¼-in. steel finger bars to the front or upper perforated plate, to help solve this problem, and these bars slice through the pile of sand at its base, keeping it loose. The two pictures show how this was accomplished.



Sand drainage system

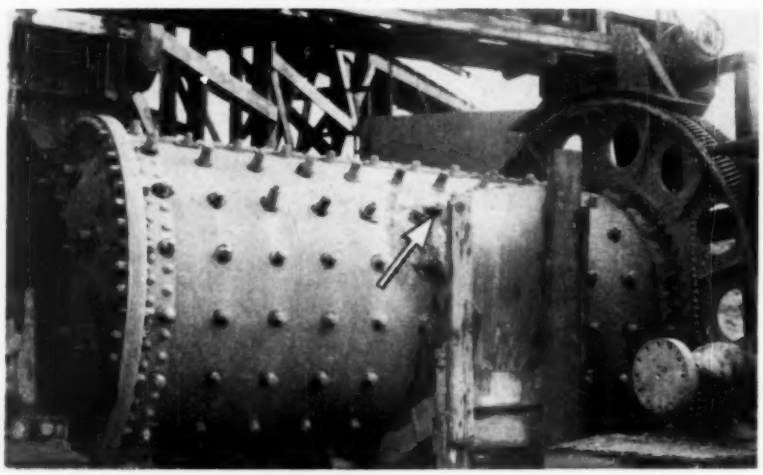
End plate before cutting slots

Tongs used to minimize crusher hang-ups

Dislodging Crusher Hang-Ups

A CRUSHING OPERATION in the Middle South uses a 25- x 40-in. primary crusher and a 10- x 40-in. secondary crusher. To help dislodge oversized rock in the jaws of the primary crusher, an enlarged version of a pair of ice tongs is used. The "tongs" operate from a pair of chain blocks as shown in the illustration. The rock is hard sandstone. The plant is semi-portable and features a 100-ton capacity surge bin following the primary crusher.

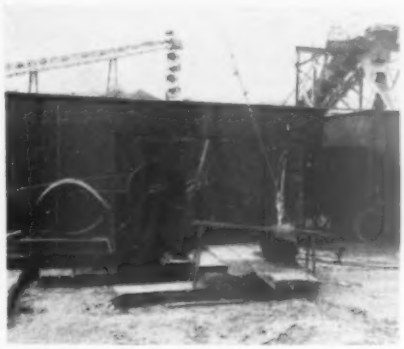
Peripheral Discharge Rod Mills



Rod mill changed from end to peripheral discharge by cutting 2- x 4-in. holes in shell, midway between end plates

IN THE WESTERN MINING section where the rod mill was developed, it is used mostly as a preliminary grinding unit, or where material in the 20- to 60-mesh range is desired. Where grinding is to be in the 100-mesh range, ball mills are primarily used. At one operation inspected, a standard discharge mill was first used, or a rod mill where the feed is through one trunnion and the discharge through the opposite trunnion. A peripheral discharge machine was then made out of it by simply cutting four holes in the shell. The holes, which were each about 2 x 4 in. in cross section, were around the drum and about half-way between the end plates of the rod mill. Feed was then introduced into both ends of the rod mill and the pulp discharged through the holes cut in the shell. It was found that four holes were too many so two of them were closed off. There is no screen or grid over the ports.

Rounded steel segments lessen wear of rope



Car puller with guard

Tail pulley bolted to foot of steel column

Car Puller Safety Features

A CAR PULLER is an innocent enough looking piece of equipment but, actually, tied up in such an assembly are dangerous features that have caused serious injury or death to many operators. In one instance, an operator saw a piece of twine loosely caught on the steel cable and as the wire rope came towards him, he reached over to knock it off but got caught in the puller's moving parts and was severely injured. In another case, a man stepped over the slack cable just as the winch started to wind up the rope and the slap of the wire rope was upwards, again causing injury. Tail snatch block pulleys of inadequate strength have sometimes failed, resulting in the rope snarl entangling a man. Bumping of cars being handled have resulted in many a fall under the car's wheels. The accompanying illustrations show some safety measures which can prevent some of these accidents.

One of the illustrations shows a rugged tail pulley (14 in.) bolted to the foot of a steel column. This seems to have all the strength required. In the second illustration, the two-drum hoist is protected by wire screen so the operator cannot easily become entangled in the gears or rope. The other picture is a detail that helps insure a longer life for the wire rope—the rounded steel segments prevent excessive wear of the rope as it slaps against the steel footings.

Steeply-inclined rotary trash screen is indicated by arrow

Trash Screen

AT A LARGE SAND AND GRAVEL operation in the Missouri River Basin, a considerable tonnage of traction sand, as well as other commercial sand products, is produced. At this operation, an 8-in. counter-flow Amsco pump does the work of a conventional 10-in. unit. The dredge pump delivers to a 42-in. x 6-ft. rotary scalping (trommel-type) screen that serves essentially as a root and trash eliminator. Some clay balls are also removed. The gravel sizes are relatively small, so having a 1-in. wire on the trommel does not reject much tonnage. The trommel is installed at about a 45-deg. angle and has lifters so that the incoming pulp causes the trommel to revolve. Attached to the unit is a ½-hp. motor which acts entirely as a brake. Previous to installing this unique trommel, vibrating screens were tried, but these became plugged from the clay balls.

Sizing Riprap

THE TRACTOR shown in the illustration has a forked front-end loader. By its use, minus 6- to 8-in. rock can be sized out of riprap or jetty stone being loaded into the truck. It is a simple method of supplying riprap and no doubt operators could use some variations of this technique in their riprap production. The front-end loader could be built sufficiently strong to handle any conventional size of rock used for jetty work, etc. The one shown here is quite rugged and handles up to 3-ft. cubes.

Forked front-end loader tractor to separate finer sizes from riprap

Highway Crossover

THE ILLUSTRATION shows how one operator in the Mid-South built a belt conveyor system over a highway

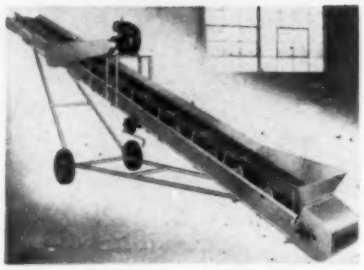
Belt conveyor built over highway

which separated the scalping operation from the surge pile. The rectangular steel trusses are supported by 18- x 18-in. concrete columns; steel panels on each side of the belt prevent any spillage onto the highway below. The operation at the time of inspection was producing riprap.

Stockpile Over Tunnel

A STOCKPILING SYSTEM at a western crushing operation, so arranged that most of the materials produced can be stored in ground storage above a good-sized concrete tunnel, is typical of stockpiling systems in some of the newer plants. Trucks enter the tunnel at one end, receive a load through a series of gates, and exit at the opposite end. Altogether, there are 16 pairs of gates in the tunnel. These are hinged at the back end so that flow of the material can be controlled by raising or lowering the lip.

NEW Machinery



Portable spool idler conveyor

Idler Conveyors

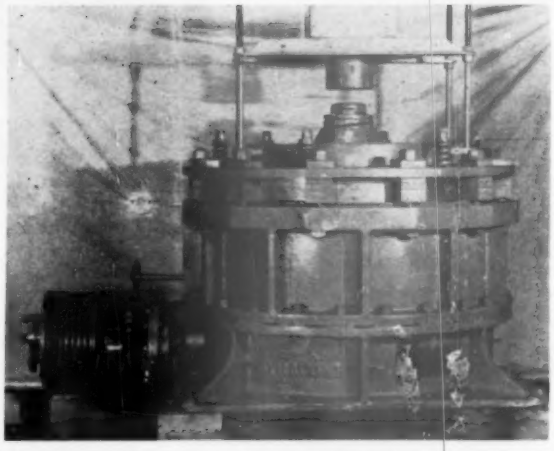
BONDED SCALE AND MACHINE CO., 2176 S. Third St., Columbus 7, Ohio, has announced an addition to its equipment line of a new series of portable and stationary bulk material conveyors, designated as the Bonded Economy spool idler conveyors. Applications include sand and gravel, crushed stone, coal, cinders and wet concrete. Belt widths are 12, 16 and 24 in., and frames of both portable and stationary models are built of braced 8-in. steel I-beams. Standard belting is heavy, three-ply rubber covered, and belt cleats are included to permit steeply-inclined operations.

Scale Prevention

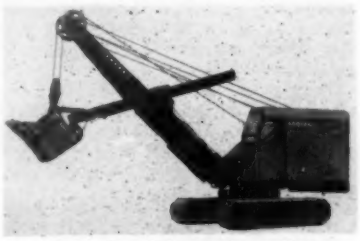
AQUA SCALE CONTROL, INC., Cleveland, Ohio, has developed a small electric unit which is said to prevent scale from forming in water lines and boilers. The unit consists of a short piece of plastic pipe spliced into an incoming water line and hooked up to a control unit. A transformer in the control unit sets up an electrical field and scale-forming particles and salts pick up a charge inside the pipe. As a result they become repellent to boiler tubes, walls and other metal surfaces upon which they would ordinarily be deposited.

Redesigned Gyratory Crusher

STRAUB MANUFACTURING CO., 507 Chestnut St., Oakland 20, Calif., has announced its 36-in. Kue-Ken Gyracone, which has been redesigned so that it is only 39 in. in height.



Thirty-six in. gyratory crusher



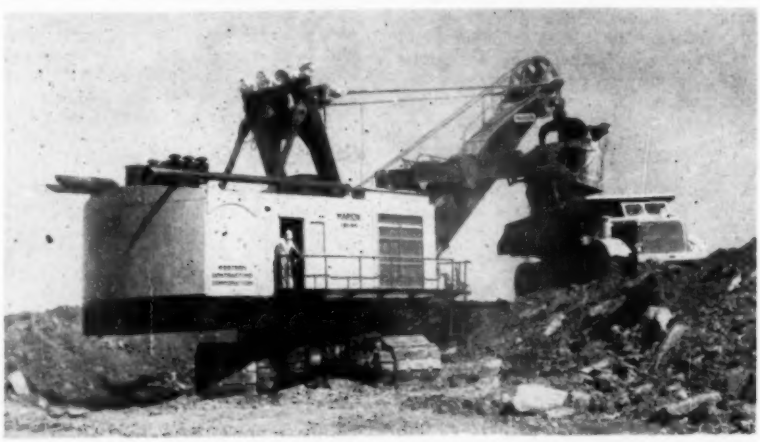
Excavator of ¾-cu. yd. capacity

Excavator

THE GENERAL EXCAVATOR CO., Marion, Ohio, has announced the addition to its line of a ¾-cu. yd. excavator and material handler, known as the Model 320. The unit is fully convertible to shovel, clamshell, crane, pile driver, dragline and hoe work. The standard shovel boom length is 18 ft. 8 in., with a dipper handle of 15 ft. 3 in. effective length, and standard crane boom length is 35 ft. Standard length of crawler is 11 ft. 4 in., with 20-, 25-, or 30-in. treads available.

Electric Screen Heater

F. R. HANNON & SONS, Canton, Ohio, originally developed its electric screen heater to speed up the screening of moist clay in the manufacturing of brick and tile. However, the company has found it to be useful in screening other materials in the minerals industries. The heater works on woven wire screens, two mesh or smaller, either old-style gravity or modern vibrating types.



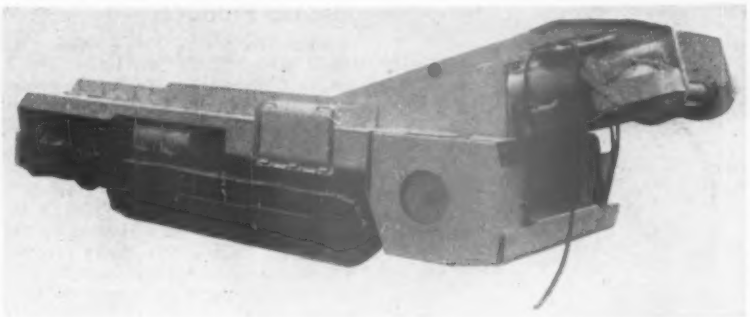
Power shovel of 10-cu. yd. capacity

Power Shovel

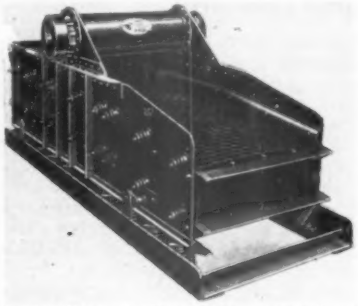
MARION POWER SHOVEL CO., Marion, Ohio, has introduced a 10-cu. yd. mining and quarry-type machine, claimed to be the world's largest, most powerful shovel on two crawlers. The Marion 191-M is basically a full electric machine with Ward-Leonard controls and is equipped with Amplidyne or Rototrol high speed electrical controls. High voltage line current is converted into direct current for powering the operating motors. For use in areas where electric power is not available, the 191-M will be furnished as an all diesel-electric machine, with diesels driving the d-c generators. This power shovel has a working weight of approximately 710,000 lb. In the photograph it is shown with a recently-developed Euclid truck of 50-ton capacity.

Shuttle Car

GENERAL ELECTRIC CO., Locomotive and Car Equipment Dept., Schenectady 5, N. Y., has announced a cable-reel crawler-type steel-track shuttle car for mine application. This unit, designed for operation in close quarters, has a turning radius of from 14 to 16 ft. The 250-volt car is driven by two sealed type, 20-hp., 250-volt series-wound motors driving each track through single gear reduction chain and sprocket. The conveyor chain is driven by two 5-hp., 1750-r.p.m. compound-wound gear motors, with a 44:1 gear ratio. The track linkage consists of steel side links with hardened steel pins and bushings and each track runs on six rollers and is supported over the top of the track carriage by two idler rollers.



Crawler-type steel-track shuttle car



Double-deck vibrating screen mounted on larger scalping screen

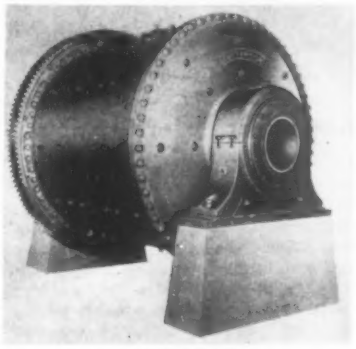
Vibrating Screen Mechanism

DEISTER MACHINE CO., 1933 E. Wayne St., Ft. Wayne 4, Ind., has announced the development of a vibrating mechanism for its vibrating screens, referred to as "Lifetime Mechanism." The reason for this name is because of the incorporation of renewable sleeves both in the bearing housing and between the spherical roller bearing and the shaft of the vibrating mechanism. Another feature is that the entire vibrating unit is jig drilled and assembled as a whole. It can be unbolted from the vibrating frame of one screen and mounted on another without disturbing the internal arrangement of the mechanism.

Tractor with valve-in-head engine

Extends Truck Line

FEDERAL MOTOR TRUCK CO., Detroit 9, Mich., has announced the production of its 3400 series Style Liner models with valve-in-head Power Chief engine. The new series is comprised of three models, with gross vehicle weights ranging from 23,000 to 25,000 lb., with tractor-trailer ratings to 45,000 lb. The company's Power Chief six-cylinder, valve-in-head engine has a 371 cu. in. displacement and develops 145 hp. at 3000 r.p.m. and 297 ft.-lb. torque at 1400 r.p.m. Hypoid gear axles and radius rod drive are standard on all models with a choice of single-speed or two-speed double reduction rear axles available. Units have five-speed direct drive transmission with overdrive transmission optional. Other standard equipment includes large capacity 13-in. clutch and 40-amp. generator.



Grinding mill

Ball or Tube Mill

PATTERSON FOUNDRY & MACHINE CO., East Liverpool, Ohio, has announced the development of a new heavy-duty continuous ball or tube mill with improved mechanical features which are declared to insure reliable operation under the most severe conditions. Adaptable to fine or coarse grinding, wet or dry grinding, open or closed circuit grinding, the mill may be used for pulverizing chemical raw materials, minerals, etc. The manufacturer states that the mill may be used to deliver a finished product, or may be operated in conjunction with classifying equipment of various types. Hollow trunnions are provided for continuous feed and discharge of materials. Mill sizes range from 2 ft. diameter x 2 ft. long, to 10 ft. diameter x 24 ft. long.

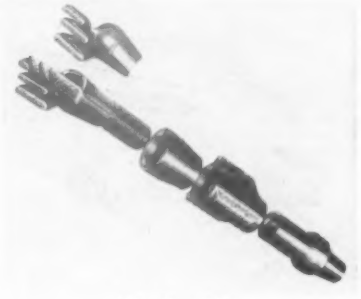
Road grader in 40-hp. class

Medium Class Graders

MEILI-BLUMBERG CORP., New Holstein, Wis., has placed in production a series of road graders known as the Models 42, single drive, and 44, tandem drive. These graders in the 40-hp. class weigh up to 15,000 lb., carry 10- or 12-ft. blades, and are suitable for medium class, ditch to ditch service, with 1:1 slopes. Mechanical features include hydraulic control and five travel speeds forward and one reverse.

Blade Bits

HERB J. HAWTHORNE, INC., P. O. Box 7366, Houston 8, Texas, has developed wing-type bits with replaceable blades, used for drilling various materials. The bits incorporate the use of tungsten carbide which, it is said, will not shatter in rough drilling. All parts are heat treated and it is reported that the cost is low. Although the bits have not been used extensively in the crushed stone industry, they have been used successfully in drilling grout holes in fairly hard sandstone and limestone.



Wing-type bits

Heavy-duty master switch

Redesigned Master Switch

GENERAL ELECTRIC CO., Schenectady 5, N. Y., has announced a redesigned master switch featuring a cast-aluminum cover and up to five adjustable stops. Standard equipment includes a ball and rod handle, but other types of operators are also available. The new switch is interchangeable in size and mounting with former G-E types, and all wearing parts, such as contacts and cams, are the same.

Extends Scraper Line

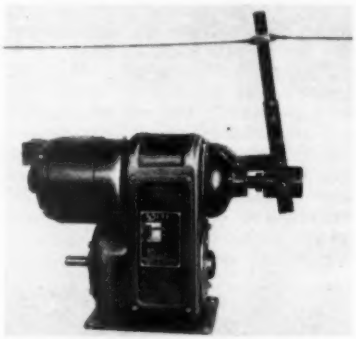
CATERPILLAR TRACTOR CO., Peoria, 8, Ill., has announced its "Cat" No. 90 scraper, designed to increase production when used with D8 tractor power. It is reported that struck capacity of 21.2 cu. yd. can be increased to 25.5 cu. yd., and heaped capacity of 27 cu. yd. increased to 31 cu. yd., with the addition of top extensions and sideboards. The scraper moves earth with the aid of a hard surfaced, reversible cutting edge, and material is carried in a flat, double-bottom bowl of high tensile steel. Operation is by means of a cable control unit, which can be mounted on the rear of the tractor, the company states, to provide for positive loading and ejection. Shipping weight of the unit is 35,100 lb.

Grease Products

THE TEXAS CO., 135 E. 42nd St., New York, N. Y., has introduced a multi-purpose grease for use in industrial applications. Known as Texaco Multifak 2 grease, it is recommended by the company for use in situations which require one multi-purpose grease for a variety of operations.

A wire rope lubricant, Texaco Crater A, also has been marketed by the company. It is a thin liquid product which is applied without heating, and is said to be durable in any weather conditions.

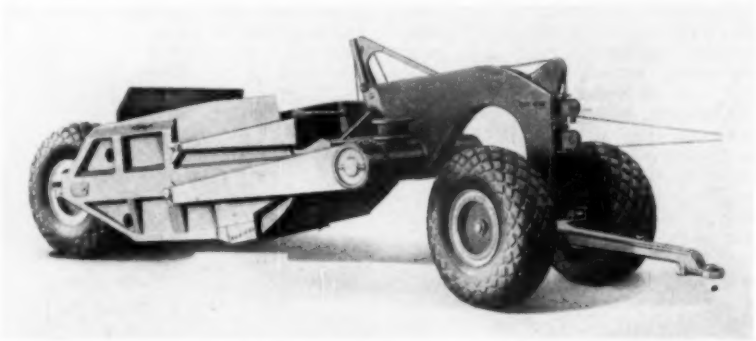
A third product announced by the Texas company is a premium antifriction bearing lubricant, designated Texaco High Temp grease. It is reported that this grease affords protection at temperatures up to 300 deg. F. for continuous operation and 350 deg. F. for intermittent operation.



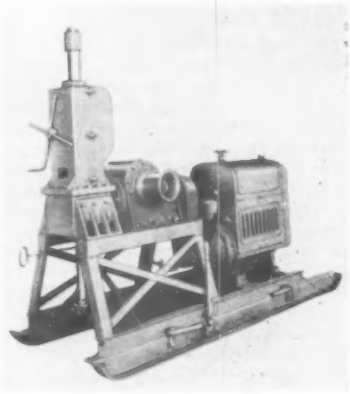
Mechanical automatic control drive

Automatic Drive Controls

REEVES PULLEY CO., Columbus, Ind., has announced the availability of mechanical automatic control on its Series 1000 fractional hp. Vari-Speed Motodrives. These drives are manufactured in ¼-, ⅓-, ½- and ¾-hp. sizes, with speed variations as high as 10 to 1. Each unit consists of the company's speed varying mechanism and the user's choice of any standard motor, with a built-in helical gear speed reducer optional.



Earthmoving tractor-powered scraper



Drill to recover cores

Shot Core Drill

ACKER DRILL CO., Scranton, Penn., has announced its Model KR shot core drill, designed to recover cores from hard or soft formations up to 20 in. in diameter and 600 ft. in depth. This unit basically consists of a heavy duty rotary drill head with a three-speed transmission, a cargo type hoist and a gear driven positive displacement pump. A shot feed system carries the shot down the interior of the drill rods directly to the cutting bit. Drill cuttings are flushed to the surface. A 15- or 25-ft. derrick can be supplied with the unit and for portability the complete unit with tower can be mounted on jeep, trailer or drag.

Disconnect Switch Starter

WESTINGHOUSE ELECTRIC CORP., Box 2099, Pittsburgh 30, Penn., has manufactured a combination across-the-line motor starter with fusible disconnect switch, available in NEMA sizes 0 through 2. This Class 11-204-N starter consists of a disconnect switch, main line fuse clips, and a Life-Line starter mounted in a common enclosure. These units are available for three-phase operation, up to 600 volts, 60 cycles.

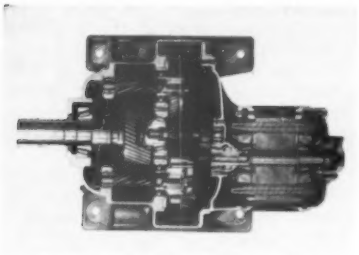
CO_2 Recorder

THE HAYS CORP., Michigan City, Ind., has announced the availability of a CO_2 recorder designed, it is said, to meet the high standards of speed and accuracy of large industrial power plants and central stations. The instrument utilizes three established ideas: the use of CO_2 measurement as a guide to combustion efficiency; the thermal conductivity principle of gas analysis; and electronic type operation. The recorder, known as Condu-Therm, features linkage of ⅛- x ½-in. bar, multiple pen bearing of telescoping stainless steel tubes, Oilite bearings, a chart plate of ¼-in. permanent mold casting, and unit construction for replacement of each main element.

Automatic filter and drain for compressed air lines

Combination Filter-Drain

C. A. NORGREN CO., Englewood, Colo., has developed a filter-drain which provides automatic removal of liquids and solids from compressed air lines, with automatic drainage of collected liquids. It is designed for use in air lines to portable air tools, air cylinders and air-powered machines where manual draining is not desired or practical. It is reported that this combination unit operates automatically under constant or fluctuating air pressure and air flow, and continues to operate when the flow of air is cut off. The unit is available in ¼-, ⅜- and ½-in. pipe thread sizes for in-line pipe connection installations, and it is recommended for a flow of 0-35 c.f.m. at pressures from 0-150 p.s.i. in temperatures from 40 to 120 deg. F.



Motor with triple reduction gearing

Triple Reduction Motor

U. S. ELECTRICAL MOTORS, INC., 200 E. Slauson Ave., Los Angeles 54, Calif., has developed, through triple reduction gearing, a high torque, low-speed motor said to be capable of ratios up to 175:1. By the use of two secondary pinions driving the output gear, the effective torque rating is doubled. The load is distributed equally between the two pinions by a splined herringbone pinion. This Type GM Syncrogear is available in 1 to 10 hp. with speed ranges of 5 to 25 r.p.m.

Electrical Tester

WESTINGHOUSE ELECTRIC CORP., P. O. Box 2099, Pittsburgh 30, Penn., has announced as available an industrial electronic surge comparison tester, used to locate insulation faults and winding dissymmetries in motors, generators, transformers and coils. The tester, available in either mobile or portable models, is compact, and is said to have adequate surge voltage characteristics for most insulation tests.

Safety Sign

INDUSTRIAL PRODUCTS CO., 2959 N. Fourth St., Philadelphia 33, Penn., has announced a safety record sign, designed to act as a constant reminder of days worked without a lost time injury. This 20- x 30-in. safety scoreboard is manufactured of 20-gauge metal, finished in baked dulux, with a dark green background and white letters, and is suitable for both indoor and outdoor use.

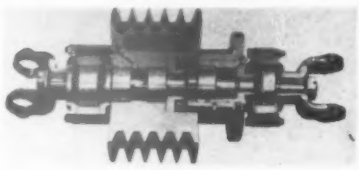
Single passenger truck

Extends Truck Line

COOK BROS. EQUIPMENT CO., 1815 N. Broadway, Los Angeles 31, Calif., has announced its new single passenger truck, Model M310, designed especially where a short wheelbase and large payload capacity are of prime importance. The unit has a lightweight, high-tensile steel dump body, a legal payload capacity of 15 tons, a 174-in. wheelbase, and is available with a single driving axle or single driving axle with third axle attachment.

Bolt Sealer

ALLIS-CHALMERS MANUFACTURING CO., Milwaukee 1, Wis., has announced the introduction of a molded rubber liner bolt sealer for wet grinding, ball, rod and pebble mills. The company reports that the sealer is designed to minimize the dripping of pulp or slurry from improperly sealed bolts, during washing or wet grinding. The new unit provides a double seal, around the circumference of the sealer and around the bolt threads. The bolt sealer comes in 1½- and 1¼-in. sizes, and replaces the old type unit which consisted of a belting washer contained in a retaining ring and a washer.



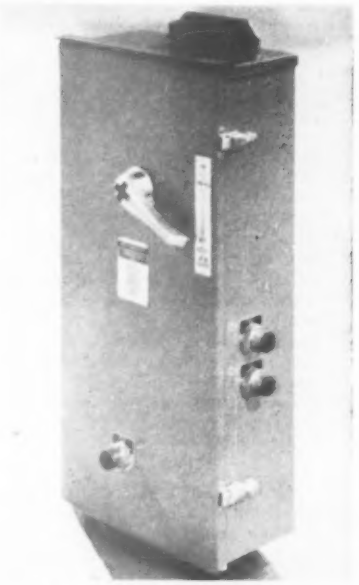
Heavy duty power take-off unit

Power Take-Off

DAVEY COMPRESSOR CO., Truck Equipment Div., Kent, Ohio, has manufactured a "packaged" heavy duty power take-off, known as the Davey P-80. This unit has 12 less parts than its predecessor and is 25 lb. lighter; the P-80 being 18 in. long and weighing 140 lb. The take-off is said to transmit full engine power to the driving of heavy duty truck-mounted equipment.

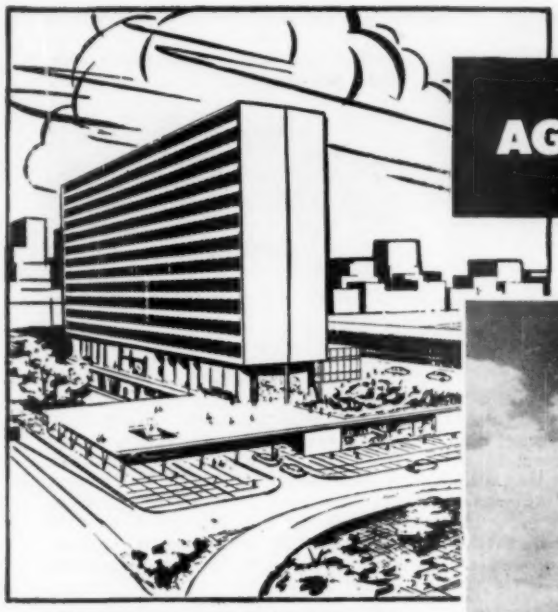
Outdoor Motor Control

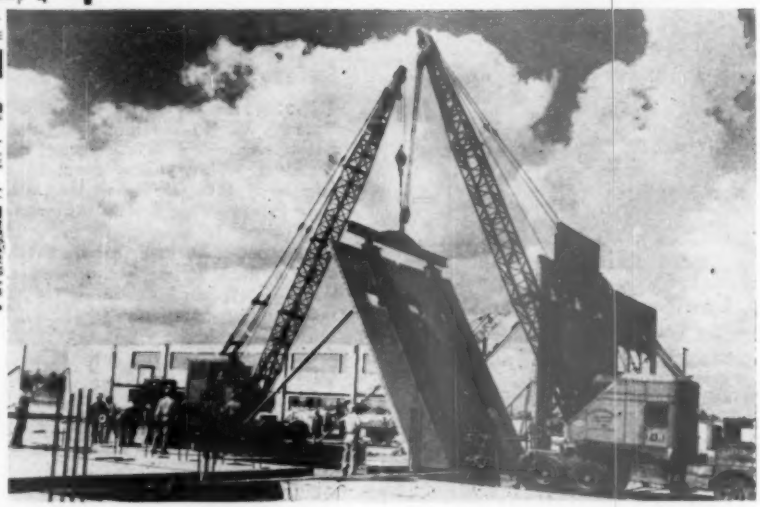
WESTINGHOUSE ELECTRIC CORP., Box 2099, Pittsburgh 30, Penn., has developed outdoor motor control units, originally designed for use on irrigation projects, but said to be applicable to other outdoor jobs. The units consist of a combination across-the-line starter with circuit breaker in a rain-tight enclosure, with a built-in start-stop push-button or selector switch. The starter and breaker are mounted on a steel panel, permitting removal of the complete interior for replacement or servicing. These starters, designated as Class 11-206-NR, are available in NEMA sizes 1 through 5.



Rain-tight motor control unit

AGGREGATES INDUSTRIES TO M





Above: Extensive metropolitan improvements and buildings now in the planning stages, such as the central rail terminal recently proposed for Chicago, Ill., will assure construction material markets for years to come. Right: New construction techniques such as those used in "tilt-up" methods are using lightweight aggregates to advantage

By BROR NORDBERG

Producers Look at '52

"Wide awake producers are constantly on the alert to make their plants more modern and more efficient. This situation will continue for another year and on into the future. Expansions will be made only after thoughtful consideration has been applied."

* * * *

"It is rather difficult in these times to project oneself very far into the future in light of present world conditions, and many things can and may happen that would materially affect our business for 1952. There is a big backlog of industrial and commercial development in the making in southern California, which under normal conditions would go ahead. We also have a tremendous highway program mapped for the next few years, but again the speed of this road program will depend entirely upon the availability of steel."

* * * *

"Due to an expected increase in volume in 1952, we anticipate further modernization and expansion of production facilities."

* * * *

PRODUCERS OF ROCK PRODUCTS and concrete products established record or near-record years for production in 1951 according to their own reports and year-end summaries of construction activities.

Construction expenditures for the year totaled some $29.5 billion but the increases in costs likely kept the year 1951 from establishing a record for physical volume of construction. Construction awards had totaled $28 billion in 1950.

According to *Engineering News-Record*, in a summary covering the first 49 weeks of the year, awards for industrial construction had increased 153 percent over last year, for private housing had decreased 36 percent, highways were 8 percent less, public building was up 8 percent, commercial construction down 38 percent, and public housing up 89 percent. A considerable volume of construction backlog had been accumulated in the range of $60 billion near the close of the year.

Construction trends as disclosed by these cumulative figures are fairly accurately borne out by producers in their appraisals of business conditions as summed up for 1951, in reply to our request for comment. We asked producers to compare 1951 business with 1950, to comment on changes in market conditions and to forecast the outlook for volume of business and prices for 1952. We also requested readers to comment on the principal handicaps to operation that would be faced in 1952 and to summarize plans for plant modernization and expansion. Response to our letter was excellent and we thank our readers for their generous cooperation. Being representative of all major branches of the industry by products and by geographical distribution, these letter returns provide a broad summary of business conditions.

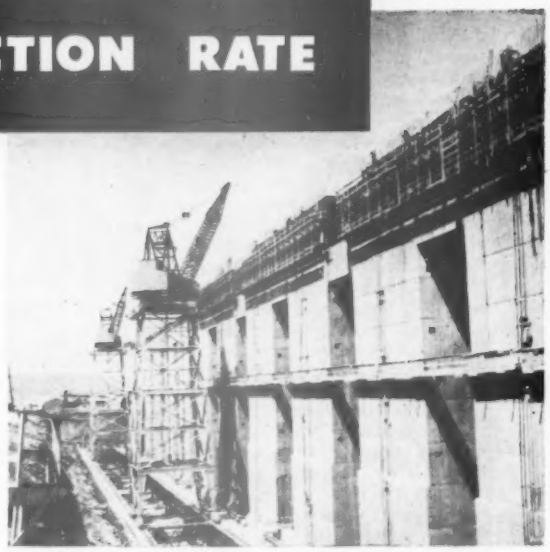
Summaries for the ready-mixed concrete and concrete products industries are published in the CONCRETE PRODUCTS section of this issue; and a separate article in this issue of ROCK PRODUCTS is a summary of returns from top officials of the portland cement industry in reply to a special letter to that industry.

Our summaries will group the review of 1951 activity and the prospects for the year ahead since the trends in business activities this past year are closely related with how business is expected to shape up in 1952. Markets definitely were being reshaped according to government activities at the year-end. General comments on the construction forecast and on anticipated highway construction activities conclude this article.

All branches of the rock products industries enjoyed substantial increases in volume of business during 1951, with individual company exceptions of course, but there has been great dissatisfaction with the price structure. The combination of price ceilings and sharply rising costs for materials, equipment and labor has cut deeply

TO MAINTAIN HIGH PRODUCTION RATE

Producers report record-breaking volume for past year. Emphasis this year to be on cost reduction to improve profit ratio



Large construction projects, similar to Ft. Randall dam on the Missouri river, will require large tonnages of aggregates

into the profits of many companies. Greatly increased production has offset the percentage profit reductions for some but that has not been the case where production has been more stable except in cases where a producer had equipped his operations for greatly improved efficiency. In a few instances, which are the exception, profit margin actually has been increased even though volume of sales was less than a year ago.

The squeeze on profits is going to result in much plant modernization and replacement of equipment to improve productivity in many operations where expansion as such is not otherwise indicated.

Letter replies indicate that aggregates producers generally anticipate that there will be price relief and they expect to raise their prices to compensate for anticipated new cost increases. A few have indicated they will install portable plants to widen markets. They seek that extremely high level of output necessary for reasonable profits. Apparently, except in unusual circumstances, profits are not attainable except with almost top capacity output. An optimistic note is that the year 1952 generally will be another of peak production except for the occasional areas which public spending will not touch directly.

Another point brought out in letters received was that competitive forces in some areas and price resistance on the part of customers have set in to not only hold prices down but actually, in a few cases, to lower them. That is true more in the concrete products industry than in the aggregates industries.

Volume of business was probably some 10-15 percent higher than in 1950 but the extent of increases and decreases depended on local conditions. There was no particular geographical region affected in one direction or the other.

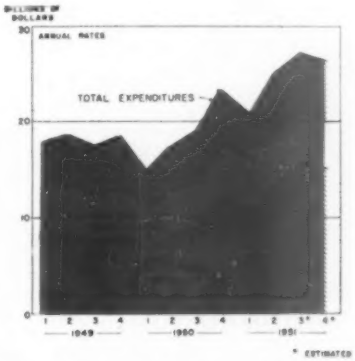
Building of the New Jersey turnpike and extension of the Pennsylvania turnpike, the construction of the new Morrisville, Penn., plant of U.S. Steel Corp., the building of dams like those in Oregon, the location of defense industries and the location of government projects are having their local effects. Some of the large concerns are shipping into defense plant areas normally outside their markets and some of the smaller companies poorly located with respect to going construction cannot compete cost-wise on many jobs. Floods and generally unfavorable weather had disastrous effects on business, particularly in the Midwest, but much of the lost business will swell 1952 sales.

As to the outlook for business in 1952, there is much uncertainty and pessimism because of regulations and confusion resulting from actions of the government. Many companies do not fear the government except for the nuisances anticipated but they do not like to see the government becoming their largest customers in favor of private customers whom the government is more and more restricting from building. Thirty-six percent of the aggregates producers who commented expect increased volume of sales in 1952, 36 percent anticipate the same volume as in 1951 and 28 percent predict that volume will be less.

Handicaps

Among the handicaps listed, the federal government, with its price ceilings, high taxes, wage ceilings and its retroactive rulings which destroy confidence, was mentioned more times than any other expected difficulties.

In many areas, availability of labor is the number one concern due to the higher wages and benefits paid by nearby defense industries. Also, the quality of labor is mentioned as suffering and there are evidences of labor unrest with sacrifice of productivity; yet, many producers have experienced no such difficulty and do not expect it barring all-out world war. Shortages of both structural steel and reinforcing steel have adversely affected the industry and there is concern expressed for 1952 if more steel and other critical materials do not become more available. Surprisingly few complained about cement shortages, although we know there were spotty shortages which, while generally of short duration, were serious. The high costs of out-of-area cement were mentioned by several as responsible for handicaps to construction.



Business expenditures for new plant and equipment since 1949

The availability of equipment parts and repair items is of concern among many producers while others, who expressed no concern, have anticipated their requirements far in advance. Railroad car shortages have cost great loss in business for some companies. One crushed stone producer in the Chicago area lost 200,000 tons of volume in 1951 because sufficient cars were not available. High taxes, of course, came in for much comment. Other handicaps mentioned were credit difficulties and load restrictions imposed on truckers. By far, greatest concern was pointed toward the ill effects of politics in government as responsible for great uncertainties.

Sand and Gravel

Seventy percent of the sand and gravel producers who commented on 1951 conditions, reported increased

volume of sales. The increases ranged from 1 to 2 percent to as high as 50 and 75 percent in the case of two producers. The average increase was in the 15 to 35 percent range which would indicate that national tonnage of commercial sand and gravel will have been increased by 15 to 20 percent in 1951 over the 1950 record year. Of the 15 percent reporting a decrease in volume of sales, the highest drop was 15 percent. The remaining 15 percent indicated that volume of sales about equalled their 1950 figure.

An Illinois producer reported a sharp increase because of an unanticipated highway construction project. An Ohio producer enjoyed a sharp increase spread over many small jobs, which he sold as ready-mixed concrete.

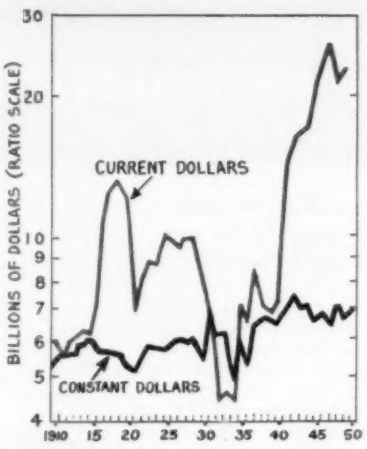
A large producer in the Detroit area commented that 50 percent of sizeable tonnage is now moved by trucks, where 20 years ago trucks only handled 5 percent. A small producer reported a 15 percent drop in sales due to competitive forces. Another said that profits were less than in 1950 in spite of a 20 percent increase in volume of sales. A Massachusetts producer increased his volume of sales entirely due to government work and a highway program. A large producer in the metropolitan New York City area is shipping large tonnages into coast defense areas by scows. Many producers in the New Jersey and Pennsylvania areas benefited by turnpike construction.

An unusual case was where a producer of average size in Ohio reported a better profit on less tonnage. He built a new plant and opened a better deposit, the old pit having nothing much left in it but pea gravel and sand. A few producers have mentioned the inroads of perlite on their plaster sand business.

Among the many comments on 1951 business, market division, and the outlook for 1952 are the following:

Large Illinois producer: "The year 1951 was a better business year for us than 1950. This was due to an increased volume of state highway construction programs in our immediate territory. Other types of business in 1951 ran about the same as 1950. We anticipate that the volume for 1952 will be from 85 to 100 percent of 1951, in other words, we believe that it will be a little less, rather than a little more than in 1951."

Nebraska: "Demand during the current year for our products, concrete aggregate, as well as sand-gravel for road surfacing, has been considerably above the same period in 1950. Construction in our local area has no doubt exceeded any postwar year, accounting for a brisk market for this product. If government regulations do not interfere this should not change in 1952. Due to a continued wet season resurfacing of roads will continue well into



Gross national farm product in current and constant (1939) dollars

1952 and only a subnormally dry year will effect the market for road material. Increases in costs of production will probably necessitate some advance in price of our product.

"The equipment-labor issues have been reversed since the same period last year. It was then expected that our operation would be dependent on availability of equipment. Equipment is now adequate for 1952 requirements, however, efficient operation has not been possible the latter part of this season due to labor shortages. This condition is expected to continue in 1952."

A large midwestern concern with multiple plants: "Our 1951 business (not including the Detroit area) shows an increase of 38 percent over 1950. The division of business percentagewise by markets is approximately as follows:

Railroad ballast	15 percent
Commercial (end use not determined)	20 percent
Aggregate for bituminous mixtures	18 percent
Defense construction	10 percent
States, counties and townships	13 percent
Precast concrete units plants	8 percent
Ready-mixed concrete	16 percent
Total	100 percent

"The 1951 increase in volume was represented primarily by an augmented demand related to highway construction and maintenance, and war preparation projects.

"It is anticipated that 1952 ballast sales will approximate those of 1951. Present indications are that the 1952 volume of other classes of materials (exclusive of the Detroit area) will decline about 10 percent."

A large midwestern producer of sand and gravel in the flood-affected area of last summer: "The year 1951, in spite of our flood, will prove to be 10 or 15 percent larger than 1950 in volume.

"We do not break down our sales of aggregates by use, but at least one-third to one-half of the sand and crushed stone are used in our own concrete plants. The only change in use that can be noted from our own records is an increase of 40 percent in the sale of asphalt sand which indicates a large increase in asphalt paving."

Southeastern Ohio: "We produced in 1951 approximately 150,000 tons of sand and gravel, the principal part of which was consumed in our ready-mixed concrete operation. Our operations cover a radius of 12 miles around this industrial city of approximately 60,000 population and we are one of four companies serving this area.

"Business in 1951 is approximately 25 percent greater than in 1950. This figure is based on housing, commercial and minor industrial construction. We have had new large volume orders which can be called either direct or indirect defense orders. The area which we serve is not in the government definitions a critical defense housing area, therefore I do not feel that housing in the area is at an abnormal high. The industrial expansion in this area is not likely to reach gigantic proportions from anything I can foresee based very largely on the past ten to 12 years. It is my personal feeling that volume of business in 1952 will perhaps be much the same as in 1951 with perhaps one market or another rising or declining. Prices should not be much higher unless the price picture nationally changes radically."

A large Michigan producer with two plants: "You have requested our comments concerning any new developments or changes in conditions affecting our business. Probably the most significant change is the trend away from rail transportation. During the past few years there has been an ever increasing amount of our materials delivered by trucks and in 1951 it appears that approximately 50 percent of the total production at our plants serving the Detroit and lower Michigan area were delivered by this means of transportation. Twenty years ago less than 5 percent of our production was trucked."

A small producer in Illinois: "Our volume of business fell off 8 to 10 percent because of increased competition and less building. Ninety percent of our business is for the building trades. I expect about the same volume of business in 1952 with the possibility of some road work opening up. We should be allowed a price increase for our material to offset our increase in costs. Gravel has not gone up in price to speak of during the past five years."

A Kansas producer: "Due to the fact the flood washed our plant almost entirely out last July 12, it is impossible for us to make any comparison for the year. However, we will state that business as a whole up to the above date showed promise of exceeding 1950 by a substantial margin."

A large producer in the New York City area: "Our 1951 business as com-

Trends in the production of sand and gravel have continued toward meeting stiffer specification requirements and demands for more sizes of product. The new Barbers Corners, Ill., plant of Elmhurst-Chicago Stone Co. was designed to produce multiple products efficiently and economically—production is 250 t.p.h. of 14 sizes of gravel and sand including washed and unwashed gravel and uncrushed and crushed gravel products. Stockpile capacity is approximately 97,000 cu. yd. of all sizes, which represents much more than the average for finished products ready for loading

pared with 1950 was varying. In our own ready-mixed concrete division our deliveries were approximately 10 percent below those of 1950. This was probably caused by government restrictions and the fact that we are not in a defense area as such.

"However, as pertains to our deliveries of scow-load lots of sand and gravel, our sales were approximately 10 percent greater in 1951 than they were in 1950. This perhaps is due partly because the New Jersey turnpike was constructed during 1951 and also because we make deliveries of scow-load lots of material into areas which have more of a defense program such as New Jersey, the upper Hudson river, Westchester county in New York and Connecticut.

"As for a forecast of the volume of business for 1952, we have formed no definite opinions and feel that unless some of the government restrictions are released that our volume will be lower in 1952 than those volumes attained in 1951."

A large eastern producer of sand and gravel and ready-mixed concrete: "Our company's business this year was better than in 1950. Our sales will probably increase as much as $5,000,000, which is an increase of approximately 20 percent. It is doubtful, however, that our net profits from operations will equal those of 1950 due, in large extent, to increased taxes. Marketwise a greater proportion of our business came from the building field in 1951. A year ago 70 percent of our sales were made to the construction industry, while in 1951 the figure is approximately 75 percent. In other words, our other division produced about the same volume of materials as last year, and the change came about through our increased sale of ready-mixed concrete and sand and gravel. It is likely that by the yearend we shall have sold approximately 1,000,000 cu. yd. of central-mix concrete in our marketing areas.

"We believe our volume of business for 1952 will be lower because of the many government regulations and restrictions that have been imposed on the construction industry.

"The prices in our estimation will remain the same or be slightly higher. We contemplate in 1952 further modernization of our plants and equipment, but not at the same rate as in the years directly after the war."

An average-size Ohio plant: "Our 1951 business will show a better profit for practically the same tonnage. The reason for this is due to the fact that we built a new plant during the winter of 1950 and 1951 and on a much better sand and gravel deposit than our old one so that our production of specification gravel was increased with the operation of the new plant. Our old plant has been in operation for 25 years, and we had reached the point where the availability of good gravel was practically eliminated and our deposit all sand and pea gravel."

Mississippi: "Our business during 1951 was better than 1950 because of volume. There were no particular markets that increased more than others from a usage standpoint, however, all the increases can possibly be traced directly or indirectly to government projects as a result of defense spending. We believe 1952 will increase over 1951 for the same reason or from the same source. That is, there will be more money for federal highways because highways are now being considered more essential for defense than they were even five years ago; housing in defense areas will probably continue to increase; rehabilitation of former army cantonments; scarcity of pine lumber will continue and continue the demand for concrete construction; cement and steel production will continue to increase; although hard to get it is going to be used somewhere and somebody is going to sell the sand and gravel to go with it. Priorities and rations on steel are not going to stop its production but will channel it into construction which I believe will be favorable to sand and gravel producers."

A producer in North Carolina: "Our 1951 business in over-all tonnage was a little more than our 1950 tonnage. However, the ready-mixed concrete business which had steadily increased for a number of years since World War II declined during 1951 as much as 35 percent. Our state highway road materials volume has increased

40 percent, this being due to our $200,000,000 farm-to-market road building program. The ready-mixed concrete volume having declined, our concrete sand market has declined in direct proportion. Since the state of North Carolina is paving very little mileage with concrete we are finding it rather difficult to dispose of our production of concrete sand. Our metallurgical business has increased greatly due in part to the increased demand for metallurgical products from the expanding war effort and partly due to our reaching new markets not heretofore shipped. We expect our volume of business for 1952 to be as great as that of 1951 and we believe price-wise there will be little if any change, unless it should be a downward trend in the price of our concrete sand. We do not believe our 1952 tonnage will hold up as well as our 1951 tonnage except for the fact that there are several large government jobs to be built in the vicinities of our plants.

"The greatest handicap to our doing business in 1952 will probably be the car shortage which has existed now for a good number of years. At the present time we have adequate labor and adequate equipment. Of course it is difficult to get new equipment and sometimes slow to get parts to keep old equipment running, but on the whole our equipment is in good condition and we have a fairly good supply of replacements.

"We will expand at least one of our operations during 1952. Plans are already underway for us to double the capacity of one of our plants. We will move this plant about 20 miles from its present location to get nearer a large military construction project. In general the trend in our business seems to be toward supplying government-built jobs or government-sponsored jobs. It would seem that the government is taking the ball away from private enterprise. We feel that some of this is certainly necessary but we also feel that the trend is wrong and should be resisted, or rather we should return to a competitive economy with as little government tampering as possible. We all realize government regulation in the construction industry plays havoc with many interdependent allied industries."

A Texas producer with two plants: "Sales from one of our plants are up about 15 percent, but our taxes have increased a like amount and, profitwise, we are no better off than we were last year. At another territory, however, where sales did not increase, taxes took more than one-half our profit.

"We are finding that the lack of steel and permits is causing commercial and industrial building construction to fall off in both territories. This is also true in both areas on housing since the government has withdrawn financial support. It is difficult to find buyers with 25 percent to 33 percent cash down payment.

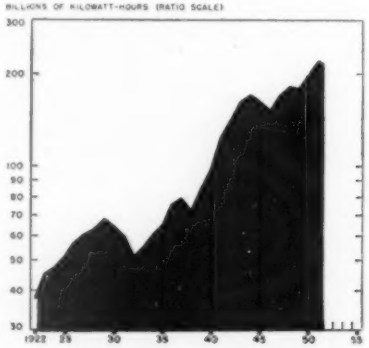
"There is to be considerable defense work in one of our areas and we anticipate that 1952 volume will be about the same as in 1951 in that area, whereas there is no defense work scheduled for the other area.

"We think there will be little other work than defense during the coming year due to lack of steel and other component parts of the construction industry. No doubt, government regulations will handicap us to a large degree, except in those cases where we are able to secure defense work. We anticipate the labor supply will get tight about next June or July."

Construction Outlook

According to forecasts, total volume of construction in 1952 will come to $27 billion which is roughly 10 percent less than the 1951 record year. It is expected that privately-financed industrial building and military construction will increase sharply whereas commercial and residential building will decline further. Possibly the number of housing starts will not exceed 900,000 as compared to the peak of nearly 1,400,000 in 1950.

According to *U. S. News and World Report*, 1952 will be a banner year with record-high levels of business, with a new flood of government spending which is expected to last at least into 1953. Spending by the government will rise to a peak rate of $86.1 billion for the first half of 1953 and a downward trend in government spending, barring all-out war, will become large in the second six months of 1953.



Consumption of electric energy by large light power users

Total spending is expected to increase to a rate of $352.3 billion in the second half of 1952 which compares with $282.6 billion in 1950 and about $325 billion in 1951. Total activity, after the government levels off in spending, will remain high compared to past years, but will inaugurate a period of competitive selling. Large backlogs of public works will remain and highway construction must be pushed at a minimum of $40 billion to bring highways up-to-date.

From the foregoing, it appears that business will be better than many of our correspondents anticipate. Among the handicaps to business which sand and gravel producers mention are the following:

"The greatest handicap to doing business in 1952, as we see it at this time, is going to be, primarily, the shortage of steel, both for highway construction and commercial and public building. The equipment and availability of labor, we believe, will be rather stable and available, and, of course, government regulations will play its part in not allotting steel because of the shortage."

* * * *

"Business in 1952 may be adversely affected by (a) a possible cement shortage, (b) government restrictions on building materials, and (c) difficulty in securing maintenance materials."

* * * *

"Steel is already a serious handicap and probably will become the major factor, however, our prosperity is geared to the automotive industry, and, if automobile production is materially reduced our company will suffer. Labor is in a plentiful supply but the shortage of structural steel is having a bad effect."

* * * *

"Our greatest handicap in 1952 will be shortage of railroad equipment and delays in getting repairs and parts for equipment."

* * * *

"The cement shortage has been a tremendous hardship this year. We purchased, for our plant in Ohio, out-of-area from Pennsylvania, Missouri and Kansas from July to November to supplement sharply curtailed local supplies. The local cement went to defense work outside our operating range. This is a serious situation and will be as great in 1952. Our profits suffered substantially from the increased cost of out-of-area cement which we could not pass on to customers until very late in the season.

"Second to the cement shortage in 1952, the labor situation will be most disturbing. The availability is not as serious as the confusion which exists among present employes. Some of the things which keep them in a state of unrest are:

'(1) Should I sacrifice relative security and seniority for higher immediate pay of a possible short duration?

'(2) Despite cost of living pay increases, I don't have enough "take home" to live as I should.

'(3) I can't save my money working here. (Here no attention is paid to the fact that houses have been recently acquired, and automobiles, television

sets, etc. are fairly new acquisitions.)'

"As yet equipment, MRO, etc. have not become a problem."

* * * *

"In all probability, our greatest handicaps to doing business in 1952 will be the availability of repairs to equipment. We anticipate no handicaps due to government regulations or availability of labor."

* * * *

"Our greatest handicaps to doing business in 1952 in my estimation are:

(a) Equipment primarily—for instance screens which formerly could be ordered for certain delivery in three weeks are now 16 weeks for delivery.
(b) Labor will be tighter but not critical unless there is an all-out war.
(c) Regulations make one wonder if running a business is worth the effort but most difficulties can be surmounted."

* * * *

"Government restrictions and acquisition of equipment will be our draw-backs during 1952. Our plant must be entirely rebuilt and equipment and repairs are hard to get and extremely high in price.

"We, of necessity, must make considerable expansion and improvement during the early part of the year in order to get back in production."

* * * *

"The greatest handicaps to doing business in 1952 will probably be: (a) new taxes; (b) shortages of steel, equipment and labor; and (c) government regulations of one kind or another."

* * * *

"Handicaps during 1952 are bound to increase. Defense spending is going to make labor scarce. Labor is going higher and the present administration hasn't said 'no' to labor yet and we don't think it will. Neither has it said 'no' to manufacturers except to us small operators who are unable to maintain a legal or political staff."

* * * *

"The greatest handicap to doing business in 1952 will be government 'gobbledegook.' There is plenty of equipment, plenty of labor, and entirely too much government regulations which do not seem to mean too much to our competitors, but are serious to us. The field of government seems to be hopelessly snarled. Nobody knows what they can do or what they cannot do except to lose their minds by degrees trying to do somewhat near what they are supposed to do."

* * * *

"In my opinion there is not the least excuse for any sort of regulations, as there is plenty of everything, the government experts to the contrary. The necessity of re-election of the present administration is the only reason behind the regulations, in my opinion. In other words, the shortages are purely political.

"In the face of the present conditions, we will do as little expansion and as little modernization as we can get by with. There are stormy times ahead and only the trim, well-manned and seaworthy ships will ride out the storm.

"In just plain, simple, ordinary every-day English, we in this country are in a hell of a mess."

* * * *

"As we see it, the handicaps to doing business in 1952 will all be predicated upon the whims and plans of a few over whom we have no influence. Our problems are purely secondary to the political motives of this ambitious group which controls our national and international destiny and we defy anyone to forecast the regulations and conditions that will exist next year. We will continue to face problems as they come."

Projects like Garrison dam on the Missouri river, with approximately 1,500,000 cu. yd. of concrete to be placed, use large tonnages of aggregates, the greater share being shipped long distances. It is expected that similar large projects will continue to be built within defense material limitations

Plant Operations

As far as plant modernization and expansion are concerned, the sand and gravel industry contemplates considerable investment, according to letters received. The squeeze on profits is discouraging many who, while not planning expansion, will do considerable modernization and replacement in the interests of efficiency and to meet changing market requirements. Typical comments were as follows:

"Generally we are carrying out modernization programs at our plants in an effort to meet more efficiently market demands. At one plant, we are now undertaking a complete rebuilding of the plant providing greater output. Expansion of facilities will be completed this winter at a second plant. A conveyor bridge across a river will be constructed next year at a third plant to permit removal of material from newly acquired deposits. Also the possibility of a plant in this locality is now being investigated."

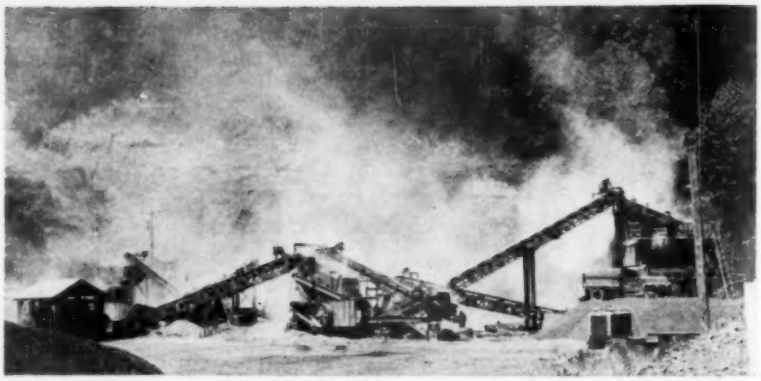
* * * *

"We expect to replace one major piece of equipment in our sand and gravel plant and increase our concrete plant by 33⅓ percent. We want to take care of our peak loads rather than increase production as we have ample facilities in both plants for our over-all requirements."

* * * *

"We do not contemplate much expansion or modernization. Nine of our 13 transit mixers are less than three years old. Purchases in 1950 and 1951 increased our other equipment. At present the only equipment on order is three new tandem trucks to replace some army tandems in our ready-mixed concrete fleet.

"A very serious problem faces our industry. Our future planning indicates a need for expansion and modernization in order to remain in business. The heavy tax load is defeating this, for we are not permitted to keep enough of our profits to re-invest in the business. Large industry can appeal to the public through issues for new capital. Small business can only increase its invested capital by additions from surplus. High income taxes prohibit the addition to capital which



Many producers have turned to portable and semi-portable equipment to augment stationary plants or to use on relatively short-lived contracts. A typical plant using portables to advantage is that of McNutt Bros., Eugene, Ore.

we must have in order to expand our business, and equip ourselves to meet our customers' requirements."

* * * *

"We are presently in the process of expansion and modernization of the plant for 1952 production. Greater production is anticipated as well as a greater ratio of operating time to downtime for repairs."

* * * *

"We presently have under construction at one of our plants a new 20-in. dredge which we expect to have ready for operation early next spring. We are also installing certain additional sand handling equipment and additional truck-loading facilities at this plant. At our other operation we are presently installing tunnels under a highway and railroad which will permit us to reach a large deposit of gravel located west of the highway by means of belt conveyors. During 1951 we have installed at both operations large dragline machines which will be used in connection with the handling of stripping."

* * * *

"We will do considerable modernization and expansion."

* * * *

"As for the modernization of our operations, we anticipate attempting to stay abreast of our industry and will modernize in all cases where we can foresee a saving. This policy will be no different from that which we have carried out in the past years.

"As for expansion of operations, that too is questionable. Perhaps it will be necessary for us to establish operations out of our immediate area to assure work for our present equipment. However, at the present time we have no commitments in this line."

* * * *

"We are continuing a normal program of modernization and some moderate expansion of certain operations."

* * * *

"We do not contemplate plant expansion. If business available demands more production, we expect to increase operating hours and add another work shift."

* * * *

"We have some expansion in mind, but doubt seriously if it will materialize in 1952, due first to the unavailability of equipment, as well as steel for the job itself. Our highway program in Texas looks good, but we feel sure that it will not go too far unless steel is made available for bridges. We feel that roads will not be built unless we can have the steel for the bridges."

Crushed Stone

Producers of crushed stone apparently have had the same experience as producers of sand and gravel in 1951. According to replies to our letter, 70 percent of the producers experienced an increase in volume of sales in 1951, 25 percent indicated that volume was unchanged and 5 percent experienced a decrease. The 5 percent who experienced a decrease was not representative because it included producers in Missouri, Kansas and Iowa who suffered loss of business from flood conditions in 1951. That business was deferred until 1952 and likely will reflect in increased volume. Increases ranged from 10 percent up to 50 percent, with an average of about 25 percent. An exception was a company in California that enjoyed an increase of 254 percent, undoubtedly due to large projects.

Here again, experience was that profits have been cut even where volume of business had increased markedly. Costs of production had increased sharply from every standpoint. Prices remained fairly stable but it is hoped that they may be raised in 1952.

Whereas the flood conditions were detrimental to business in the Midwest, losses of regular business were in part offset by increased volume of riprap in several cases. Producers in this area, Missouri, Kansas and Iowa, were more effected than is realized. Many of them have underground mining operations and were faced with the necessity of drying out the stone before processing it, long after flood waters receded. The shift toward more defense projects and related industrial expansion was apparent.

As to the outlook for business in 1952, 52 percent of the companies reporting anticipate a larger volume, 46 percent expect the same levels as in 1951 and 2 percent believe that volume will be less.

Among the comments on 1951 business and the outlook for 1952 were the following:

A Texas producer: "Business in 1951 was about 50 percent higher than 1950. This increase is approximately 10 percent in riprap, 10 percent filter media, 10 percent railroad ballast and the balance was scattered among our regular types of businesses. We anticipate that 1952 business will be about the same as 1951. Prices for 1950, 1951 and 1952 are to all intents and purposes practically the same.

"Our business has been affected in 1951 and will be more so in 1952, due to the national expansion and industrial shifting to the Southwest.

"Summarizing, we anticipate good business, shortages of open-top equipment, shortages of labor and considerable difficulty in securing even those necessities in supplies to maintain minimum efficiency in operation, and too much governmental interference."

An Iowa producer: "We have found that the volume of business in 1951 is ahead of that for 1950, but the net profit is down. I am unable to give you a fair estimate of the division of business percentage-wise and by markets at this writing. We expect the 1952 volume to be off somewhat, however."

A producer of crushed stone, sand and gravel and ready-mixed concrete in northern Illinois: "At the end of the year our tonnage sales will be approximately 2,100,000 tons of sand and gravel, and 2,600,000 tons of crushed stone, a 21 percent increase over 1950. About 12 percent of this tonnage was chemical and metallurgical stone, including agricultural limestone. Eight percent was railroad ballast, practically all crushed stone. The balance was used in construction and maintenance work. There was no significant increase in any one division.

"We expect a substantial increase in demand for road construction materials in 1952, but the building construction demand appears uncertain. It is our guess that the over-all demand will be about 10 percent less than in 1951. Prices will probably be about the same as in 1951."

From Iowa: "Our 1951 business increased by about 10 percent in volume at about 1950 prices. Flood conditions were responsible for greater tonnage of riprap while crushed stone was about the same, but there was a de-

cided loss in agstone. In spite of additional costs the price will likely not change appreciably."

A small producer of agstone and road stone in Missouri: "I would say that 1951 is the worst year for the past several years, as to volume of business, profits, and labor problems. Please bear in mind that we were affected by the worst flood disaster in history in this section of the country, and heavy rains prevented us from operating throughout the year. Due to these weather conditions, we are just now fulfilling contracts that we bid before the Korean war, at much lower prices than we would now bid, but we are paying higher prices for material, labor and supplies. Also we have two large defense plants within commuting distance of our quarries, and these plants draw people from their regular jobs, which forces us to operate with a much poorer type of labor. With weather permitting, we should have a much better year in 1952, as we will be rid of these old lower price contracts."

A summary of conditions affecting Missouri producers of crushed limestone and agstone: "The volume of crushed rock and agricultural liming materials business during 1951 was less than in 1950, in Missouri, in spite of the fact that the demand for these materials was increased. This situation is due to the fact that weather conditions in Missouri during 1951 as a whole were the worst experienced in the history of this industry.

"Missouri experienced a record-smashing flood during 1951 in the entire Missouri River Basin. This flood condition resulted in the inundation of several substantial rock producing plants for periods varying between three weeks and 60 days. In every case of inundation, much additional crushing time was lost due to necessary clean-up and plant renovation.

"One particular problem was experienced which was unexpected by producers operating underground mines which were inundated. After flood waters receded from these operations and the floors of the caverns dried out sufficiently for quarrying operations to begin, it was found that the moisture content of the rock was so great that immediate crushing was impossible. In these instances fans and heating units were installed in the caverns for the purpose of drying out exposed rock faces. This drying out process has been carried on over a period of several months since the big flood and some rock is still too difficult to crush well.

"It is expected that the volume of business in 1952 will surpass that of 1951 by a sizeable percentage in Missouri, weather permitting."

From Wisconsin: "The crushed stone and agricultural limestone business was about 10 percent better in 1951 than in 1950. This is a true picture inasmuch as our prices for the two years were identical. The general use of our product was about the same and the increase was due to a couple of those jobs that come into a territory once in a lifetime."

From New Hampshire: "Our plant showed an increase of about 20 percent in gross tonnage over 1950. I expect about the same increase for 1952 over 1951, and have orders already to substantiate this. Prices remain the same but labor and equipment costs are somewhat higher.

"Our crushed gravel sales are receiving quite a boost from the New Hampshire highway department which is going in more and more for higher types of road surface on both new construction and maintenance work."

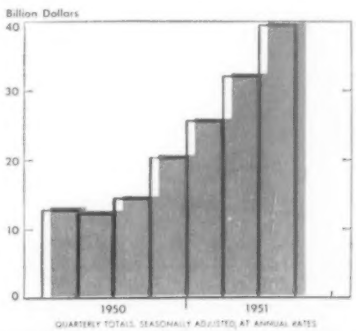
A large Eastern producer: "Our business in 1951 is broken down into two principle categories—extraordinary demand in the form of the New Jersey turnpike, and so-called regular business. The over-all volume showed an increase of approximately one-third over 1950. Normal business, however, showed an increase of approximately 10 percent.

"It is virtually impossible to predict our volume for the coming year, but the roughest kind of guess would indicate that normal business will return to the approximate level of 1950 and work on the New Jersey turnpike will, of course, be ended."

A large Ohio producer of metallurgical, chemical and commercial stone: "Our 1951 business volume compared favorably with that of 1950. Some product tonnages were above 1950 and some were below.

"We had no significant market changes. Further than this we do not anticipate serious price or volume changes as regards 1952. We definitely know that if there are any price changes they will be upward rather than downward. The small part of our business which is depending upon building construction will no doubt suffer some loss in 1952. We do not look for any less volume in the street and road construction market."

A summary of conditions among Pennsylvania stone producers: "The 1951 business in dollar values and in tonnages exceeded the commercial stone sold during 1950. The construction of the Pennsylvania turnpike's western extension accounted for some of this tonnage increase. The average prices for 1952 will be about the same as 1951. The volume will depend to a great extent on the amount of steel which is made available to the construction industry.



The rate of defense spending now is nearly three times that of a year ago

"The greatest handicap to the crushed stone industry in 1952 will be the government control of strategic materials necessary to keep the construction industry booming.

"I can report that a considerable number of plants have already been modernized and expanded with the work already started. However, in other cases, some plants are still in the planning stages for 1952."

A New England producer of crushed stone and ready-mixed concrete: "I will attempt to give you a thumbnail sketch on this company's business. We are enjoying our fifth good year with an acceptable volume and a fair margin of profit. However, crushed stone prices have not risen in the last year and the costs of producing stone are steadily going up. The prices on ready-mixed concrete have been falling slightly and the costs are rising sharply because of the increase in prices for cement, freight, labor and equipment. In other words the squeeze is on and the margin of profit is shrinking. I believe that there will be a further shrinkage in the profit margin next year on both crushed stone and ready-mixed concrete.

"The long range outlook for ready-mixed concrete is dismal because so many new plants have been built and so many new delivery units added to the old plants. We only need a slight shrinkage volume to result in a 'dog-eat-dog' situation. In the next five years I look for many failures in the concrete business.

"Our crushed stone is used principally for roads, airports, railroad ballast and concrete aggregate. Our ready-mixed concrete is used mostly in private home construction, school houses and road work. The percentage going to each outlet has not changed materially in recent years but I believe next year will see much less private construction and the steel shortage may hamper road construction to a large degree. I do not anticipate any particular production problems next year because I expect that demand will be off from the peak we have enjoyed for the last three years. We do not expect to expand, but we would like to continue our modernization program which is still several years from completion."

A Pennsylvania producer of crushed stone and ready-mixed concrete: "In comparing 1950 with 1951 it must be taken into consideration that in our business we were not directly bene-

fited by the defense program, having no government contracts or subcontracts. However, due to a great many road contracts, and building projects in this vicinity, our gross sales for 1951 are going to exceed our 1950 gross sales by approximately 40 percent. This added volume of business will be offset somewhat by higher operating costs and taxes, but the net income should be considerably higher than that of 1950. There was no significant change in our markets, percentage-wise, but an over-all increase in buying by our largest customers and, speaking percentage-wise, a nearly equal increase in each product we market.

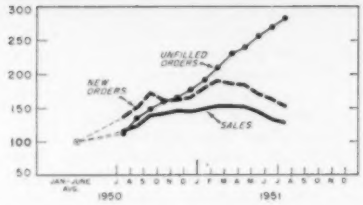
"Our volume of business and prices for 1952 can hardly be estimated, due to the static nature of our particular business. The present outlook seems to indicate a substantial amount of business, but since the Pennsylvania Department of Highways is our largest single customer we cannot predict their buying policies a year ahead, because they cannot do that themselves. It will hinge entirely upon the amount of money appropriated by the legislature for the highway system. Prices will have to compare with 1951 as long as price controls remain, but there is a feeling in the industry that provisions will be made for relief in certain products, namely ready-mixed concrete, and bituminous materials.

"One new development we would like to comment on is the final passage of the depletion law which gives limestone producers an opportunity to claim their just and necessary depletion tonnage and receive benefits enabling new development of resources to replace those being depleted. This law affects the whole industry and should rate attention in your summary as the development affecting the industry more than any other in 1951."

A West Virginia limestone producer: "Our total business was about 20 percent larger in volume than in 1950. The division of business percentage-wise was about the same as last year with only a slight increase in railroad ballast. We do not anticipate any increase in business or prices for 1952."

A Georgia crushed granite producer: "It may seem strange to you that we do not feel competent to give more definite or accurate answers than offered, but to us the general economic situation, at least applying to our business, is subject to an ever growing era of indecision governed probably by the feeling in the higher echelon that businessmen are not to be entrusted with current facts.

"Business in 1951 closely followed the pattern of 1950, and divisions of business were about on the same ratios. We expect 1952 to follow the general pattern of 1951. This is in respect to volume of business but believe the markets will show the trend from civilian to war economies."



Production trends in the electrical machinery industry

From Tennessee: "Our volume of business in 1951 was greater than in 1950, due to a large contract in connection with the Arnold Engineering Development Center project at Tullahoma, Tenn. The division of business was similar to previous years with the exception of a larger quantity being sold for concrete aggregates. As we now see it, our business for 1952, as far as volume is concerned, will be more in line with 1950, and the prices will be about the same as 1951. As a matter of fact, regardless of ceiling prices and whatnot, the price of crushed stone in Tennessee has not advanced, due to the large number of operating companies which makes competition keen."

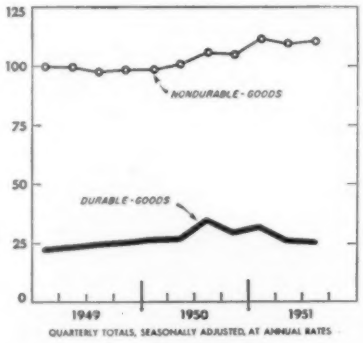
From South Dakota: "Our 1951 business volume remained at practically the same level as 1950. Our principal market was, as always, construction projects both private and public, which use approximately 80 percent of our product. The other 20 percent is divided between industrial uses and railroads. We expect a substantial increase in volume for 1952, with prices averaging about 10 percent higher than 1951."

West Coast: A large producer of crushed stone, sand and gravel and concrete products including prestressed concrete roof, floor and wall sections assembled from precast concrete units, had the following favorable report on 1951 business: "The year just closing has been an excellent one for us. Our percentage of increase in sales is tabulated below:

Concrete masonry units	9.5 percent
Prestressed roof, floor and wall sections	154.9 percent
Sand and gravel	32.2 percent
Quarry products	254.9 percent

"The increase in concrete masonry units was due to military construction and Wherry Act housing. We have suffered a loss in residential and commercial building. Prestressed concrete increases in sales can be attributed to the creation of new uses of the material and an ever increasing acceptance of the product. The increase in sand and gravel sales is due largely to a tremendous gain in population of the area served by this plant. Increases in sales of quarry products can be attributed to military and state highway construction in our marketing area.

"Although our volume has shown substantial increases, our operating costs have been higher. With prices remaining the same, profits are naturally lower when computed on a percentage basis."



Durable spending by the American public remained substantially below previous highs during 1951

Business Handicaps

Among handicaps to doing business in 1952 which were mentioned most frequently were: shortages of open-top railroad cars, fear of loss of men to high-paying defense jobs during the winter lay-off season, scarcity and indifference of labor, difficulties and delays in obtaining equipment and repair parts, roadside competition, high freight rates, rising costs without compensating increases in prices, and restrictions on structural and reinforcing steel. The indecisiveness of government was mentioned frequently and one producer summed it up in the one word "Truman."

Typical comments were:

"The biggest handicap to be experienced during 1952 by Missouri limestone producers is expected to be a serious labor shortage. This problem was evident during 1951 but was not as pronounced as it might have been due to the fact that bad weather interfered with production.

"Machinery shortages will be evident but are not expected to seriously hamper production. This statement is based on the belief that rock producers are universally aware of the importance of maintenance and repair of crushing equipment. It is believed that the condition of equipment which will be used in Missouri during 1952 is satisfactory.

"Government regulations are not expected to handicap production but, rather, these regulations are expected to be quite helpful to the industry.

"This is especially true in O.P.S. Regulation No. 77 affecting ceiling prices of agricultural liming materials. This regulation seems to be the most logical and helpful of any governmental regulation to come out of

Typical of the plants furnishing materials for construction of dams on the Missouri river is this plant of Tobin Quarries, Inc., Alexandria, S. D. An unusual feature here was the use of hammermills to eliminate flats. From right to left: dump truck unloading at the primary crusher, two cone crushers in closed circuit with the vibrating screen just to the left of the cones. In the center of the picture, a vibrating screen makes a product suitable to go direct to final screening plant and balance of material goes through the first hammermill for elimination of flats. Material from that hammermill goes to vibrating screen (left center) where another separation is made, part going to the final screens and the remainder to the second hammermill for another flat elimination. Part of the final screening assembly is at far left

Washington in the last ten years."

* * * *

"The greatest handicaps in 1952 with us we anticipate to be shortages of open-top cars. We expect our usual handicaps with securing the necessary supplies for keeping our machinery going and particularly anticipate rubber shortages which will affect our supply of belts and tires. Labor will be hard to secure in the area in which our plants are located, due to the enormous expansion of governmental activities and shifting of industries to our area. Certainly we anticipate the usual amount of grief in governmental regulations."

* * * *

"We do not anticipate any serious handicaps because of lack of equipment or labor in 1952. Government regulations may have some bearing on what we do, especially insofar as steel allocations are concerned. One big handicap we encountered at our operations this year was the shortage of railroad cars and we do not anticipate any improvement in this situation. Some of our plants cannot operate without a fair supply of cars, and in 1951 we estimate that our sand and gravel production was at least 200,000 tons less than it should have been."

* * * *

"The greatest handicaps of doing business in 1952 will be government regulations, particularly those restricting certain classes of buildings and limiting use of controlled materials, particularly steel. We contemplate modernization and improvement at most of our plants, and have started construction of a new four-kiln lightweight aggregate expanding plant. Our activities have already been seriously curtailed by government regulation."

* * * *

"As to the handicaps of doing business in 1952, we believe that government regulations will cause us more trouble than anything else, although this will not be any tremendous and unsurmountable obstacle. We find that, after we become familiar with the several regulations, they are rather simple to administer."

* * * *

"The greatest handicaps to doing business in 1952 will be government regulations, which affect the availability of new machinery, repairs, and steel for road improvement, which affects us directly. Our labor situation is rather steady and, unless an outright declaration of war should cause drafting on a large scale, we will not suffer from manpower shortages."

* * * *

"I think availability of labor will be the greatest handicap during 1952, due to the tremendous salaries paid in defense work. You may quote me on this—I think if the government wants to curb inflation, a good start would be to keep defense wages down to the level of other similar wage scales."

* * * *

"I think our greatest handicap in doing business in 1952 will be labor although up to the present time we have had no trouble. Many of our men have been with us from 10 to 20 years and our union relations are perfect. But with the influence of a demoralized government in Washington, the higher taxes, the uncertainty of the national picture, the unnecessary war in Korea which takes the lives of sons and daughters, without using the means we have at our command for a quick victory, all take the minds of men from their work and from a pleasant home life. I could give you many more reasons along the lines of undermining our national patriotism, etc., but that is another subject."

* * * *

"Indecision — failure to establish definite policies governing the conduct and cost of doing business in the field of taxation with the established procedure of ordering retroactive measures that preclude any normal or business-like policies in determining costs of manufacture and relative sales prices of products."

Modernization

On the subject of plant modernization, there is expected to be much activity among crushed stone producers in 1952. Many anticipate replacement of equipment to better be able to meet changing specifications and more adequately serve their markets. Competitive conditions are becoming a factor as is the necessity for greater efficiency in view of rising costs. Several of the larger producers are planning to install recrushing units to meet the growing trend toward requirements for smaller sizes of stone and in a few cases portable plants will be purchased as auxiliaries to extend marketing areas.

Many producers indicated that modernization is to be given emphasis as a continuing policy instead of great expansion. While many others contemplate expansion, there is a tendency among some to defer contemplated expansion until the national picture is clarified and stabilized. They feel, in view of increasing operating costs and the high taxes, that it is difficult to justify great enlargement of production.

Among comments were the following:

"We anticipate our usual modernizing and expansion program if we can secure the steel, machinery and labor to do so. This program usually runs about $150,000 per year and should amount to that much or more in 1952."

* * * *

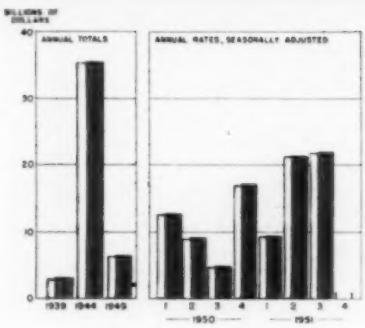
"We plan to do some modernization, but no expansion in 1952."

* * * *

"To stay in the swing, it will be necessary to modernize constantly. Roadside competition and restrictions on construction will no doubt be felt."

* * * *

"Although we do not close our fiscal year until March 31, 1952, and then have our annual stockholders' and di-



Personal saving increases

rectors' meeting, at the present time we do not anticipate any further expansion but will be buying some equipment for normal replacement."

* * * *

"We do not contemplate any expansion of our operations but do intend to make several small installations for the purpose of improving the efficiency of operations, and also make such small additions that may be necessary to keep pace with the changing requirements in materials for highway construction and maintenance."

* * * *

"Our plant is in perfect shape at the present time inasmuch as we have always tried to anticipate our needs a year or more in advance. We will not do any expanding whatsoever under the present tax structure. When we compare the way the national government spends the tax money with the way it would be spent by a truly American government, we have lost our incentive to increase our business, expand or do anything which would increase our tax burden. And we are not alone in our thought as most every business I have visited with feels the same, with the exception of a few who are operating under the New Deal policy of grab while the grabbing is good.

"The only thing that can be done is to pray for a miracle that our people will realize that whether it be an individual or a government no one has yet been able to borrow and spend his way to permanent security."

* * * *

"We have expanded two plants in 1951 to increase production and have erected 80-ft. concrete silos for increasing our agricultural limestone capacity and sales, but have no plans laid for further expansion in 1952. The present outlook on materials and the rather unstable nature of the national economy tends to discourage plans for further expansion, especially a long range building program."

* * * *

"At this writing we are not contemplating any important expansion of our operations. New equipment is needed, however, and something will be done along this line."

* * * *

"We contemplate only such changes as may be essential to conform to changing markets but not major expenditures for expansion because of regulations that retard or prohibit reasonable construction costs, and tax laws that take the larger part of profits with no participation in losses."

* * * *

"Our company is continuously modernizing its facilities, and we always keep an eye open for expansion if and when suitable opportunities present themselves. In the year 1951, we did modest modernization of equipment so far as our crushed stone facilities were concerned. In our concrete products division we added certain other products that we had not produced previously, and in the year 1952 we intend to further expand in the concrete products field."

* * * *

"We are at the present time expanding one plant. In the spring of 1951 we erected a new and larger gravel plant in another section of the state."

* * * *

"We will erect two recrushing plants to meet increased demand for small sizes of aggregate."

Lime

In nearly every case, producers of lime, many of which also produce crushed limestone products, reported increased volume of business for 1951. There were some decreases in building lime reported but with compensating increases in chemical and metallurgical products. Prices have remained relatively stable. Among the comments were the following:

From the Southwest: "General volume of business in 1951 was about the same as for 1950 during the first nine months. Last quarter volume was higher in 1951. Reason was introduction of a new product on the market and the increase was all attributable to this. The outlook for 1952 is for about the same output during the first half but a decrease in the last half of the year. Prices will remain constant.

"Handicaps to 1952 production appear to be in equipment and repairs for equipment. Thus far, no labor shortage or government regulations have caused appreciable difficulties.

"We look for no further expansion in 1952. However, we made this statement one year ago and then later introduced a new product produced with all new equipment."

From Pennsylvania: "Our business for 1951 was somewhat greater than our 1950 volume. The most significant change was a rather definite increase in the percent of our material that was being used for open hearth and blast furnace fluxing purposes. This phase of our business was approximately 20 percent higher for 1951 compared to 1950. We anticipate a greater volume of business in all lines for 1952. Our prices should remain relatively stable with the exception of agricultural limestone which has been increased 50 cents per ton.

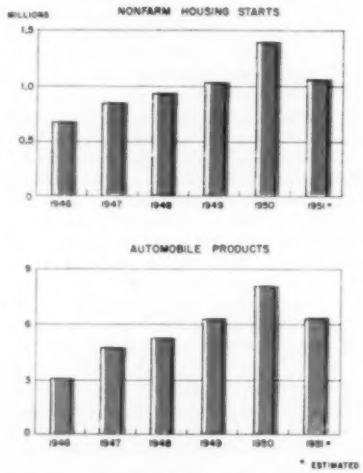
"The greatest handicaps that we see to doing business in 1952 would be the securing of the proper equipment, and also government regulations with respect to price. There is actually nothing that we feel will be an insurmountable obstacle.

"We do contemplate a further modernization and to a certain extent, an expansion of our operations. During the past year we have installed several new pieces of equipment at the primary end (loading, hauling, and primary crushing) and will need to install some additional capacity in the secondary phases of our operation. It is our considered opinion that our volume of open hearth and blast furnace limestone should increase six to eight carloads per day for 1952, above our 1951 shipments."

An Eastern producer with several plants: "Business in 1951 will probably be about 10 percent ahead of 1950. We are operating at capacity at practically all plants, except for the operations making building limes during the last two months. As long as the restrictions on building are on, we look for some drop in our volume of products shipped to the building industry, at least for the early part of 1952.

"We do not look for any substantial change in prices, at least for the early part of 1952 — maybe not at all through the year.

"As to the handicaps to doing business in 1952, it seems to me they



A defense economy has caused major civilian cutbacks in housing and automobiles

would be pretty much what we had in 1951, only more so.

"We contemplate further modernization of our plants, particularly those producing materials for the steel industry."

A producer of lime on the Pacific Coast, in comparing conditions for 1951 with relation to 1950, reported a 10 percent increase in physical volume, 15 percent increase in dollar volume of sales, a 20 percent increase in taxes and operating costs, and a 30 percent drop in net profits.

Miscellaneous

Producers of industrial sands, blast furnace slag, phosphate, perlite and other nonmetallic minerals, generally, reported excellent volume of business in 1951 and their predictions for 1952 business followed the pattern as stated by the sand and gravel and crushed stone industries. The two exceptions were the slag and perlite industries where producers, without any exception, reported greatly growing volume that is expected to increase.

Among comments from these industries were the following:

From the National Slag Association: "At our annual meeting, just completed, it was the consensus of the directors that 1951 would prove to be another record year so far as sales of slag are concerned. As to a breakdown of the markets served by our commodity, it appears that sales were directed to those uses pretty much along the pattern of 1950. Concerning the volume of business for 1952, there is reason to believe that it will be at least as good as 1951, and probably better.

"Due to increased costs of labor and operating supplies, it was felt that there would have to be an accompanying increase in the sales price of slag, however, the restrictions of O.P.S. will, undoubtedly, prove to be an obstacle in this regard.

"In general, slag plants have been modernized during the past few years, so there is nothing outstanding contemplated in this direction, and insofar as expansion activities are concerned, these may be confined to slag operations which will likely be started in connection with the new steel plant of U. S. Steel Corp. in Morrisville, Penn.

"Emphasis of our research activities currently underway is given to the properties of slag block. One of the major projects sponsored by the group is being conducted by Underwriters' Laboratories to determine fire resistance of slag block, and another investigation involving slag block is underway at the University of Toledo."

An Ohio slag producer: "Our gross business for 1951 will exceed that of 1950 both in dollar volume and tonnage. Percentage-wise, approximately the same volume of business was done by markets as in the year previous. We should do approximately the same volume of business in 1952 as in 1951 and prices will remain the same if price and wage controls remain in force.

"We do not anticipate any handicap to doing business in the year 1952 except possible labor strikes in the steel industry, or some change, as yet unknown, by the government affecting our industry. We are not contemplating any further expansion in the year 1952."

A Pennsylvania slag producer: "Business in 1951 was good and will top that of 1950 by 6 percent. I may say that 1950 was also a good year. I am unable to give you percentage-wise our participation in the market we serve which is a radius of 60 miles from the production point, but I do not believe there was any change in our proportionate sales with those of competitors, as all of us had wonderful business. We anticipate 1952 as being equally good as 1951, but no better with prices remaining the same.

"We do not anticipate any material handicaps in equipment, labor or government regulations.

"The only development I can mention in changing conditions is one which I believe the railroads will regret in the future, and that is that practically all slag products will be trucked from the plant to construction projects due to the high freight rates now claimed on rail shipments."

A large Eastern producer, principally of foundry molding sand: "Our 1951 sand business was about 30 percent greater than in 1950 and sales prices were about 10 percent higher than 1950. We expect our volume will be less in 1952 than in the current year by about 10 percent and that prices will remain unchanged.

"We expect the 1952 handicaps to be mainly the scarcity of productive equipment and repair parts thereto. We do not anticipate a general shortage of labor except in locations close to large manufacturing plants producing defense work. We have already felt that in some locations where cost plus projects are being developed.

"We do expect to continue plant modernization but this is a constant program with us as new processes are developed by our customers requiring close specification material from us.

"One of the most spectacular developments in the field of foundry sand is the development of the shell molding process. Where the conventional mold was made with a total depth of 8 to 10 in. of sand, the new process reduces this to a thin shell of sand on each side of the mold cavity, the shell ranging from ¼ to ⅜ in. It permits castings to be made to close tolerances as far as dimensions go and creates a demand for unusually fine unbonded sand."

A Midwestern producer of molding sand: "The first six months of 1951, the volume of business with our company was sharply up. The second six months were sharply down with no change by markets.

"We expect our volume in 1952 to possibly be down with prices unchanged.

"What will be the greatest handicaps to doing business in 1952? The answer to that one is the Truman administration and his coterie of bureaucrats."

A Western producer of perlite ore and expanded perlite: "Our volume sales of crushed perlite rock increased this year 50 percent over last. We maintained practically the same customer list but their increased business accounted for the larger demand from us. We anticipate a comparable increase next year. Prices should be increased some but whether they will be will depend largely on conditions and the O.P.S.

"Having completed a new perlite crushing and screening plant we feel we are up-to-date. Increased demand will govern further expansion."

Fluorspar: "With reference to other new developments, I am sure you will be interested in a brief note concerning our fluorspar operation at Meyers Cove, Idaho. On the basis of the increased demand for acid-grade fluorspar by private industry, as well as the urgency of stockpiling the concentrate on a national basis, the Meyers Cove fluorspar deposit, generally known as the Chamac Mines, was activated in March, 1951. Practically starting from scratch, including development of ore and installation of milling equipment, the milling of concentrate got off to a reasonably early start. By August 1, 1951, the first acid-grade spar was loaded aboard cars at Mackay, Idaho. The present capacity of the mill is estimated at 100 tons of crude ore daily and indications are that on the basis of optimum recovery considerably more than a carload of concentrate will move from this facility every 24 hours. Plans for the expansion of this facility, both from the standpoint of increased ore tonnage and increased milling capacity, are now underway."

Gypsum

AGRICULTURAL MINERALS FERTILIZER CO. recently began gypsum mining operations at properties located near Los Banos, Calif. The company holds leases on two large deposits and is shipping crushed material to San Joaquin Valley and other California areas. Alvera Sousa is head of the company.

Urban throughways, similar to those in New York City (above) and Los Angeles, are in the planning stage in many cities

HIGHWAY OUTLOOK

SINCE MANY AGGREGATES PRODUCERS and the portland cement industry depend to considerable extent on highway construction for business we asked state highway officials to comment on the outlook for 1952. We also asked their comments on the relative merits of asphaltic pavements and portland cement concrete pavements and for any new information on granular subbases. The majority of the states replied and we hereby express our appreciation for their cooperation.

Apparently, highway construction might not fall off as many forecasters have indicated because the majority of the states, with qualifications, have indicated that construction in 1952 will equal or exceed that of 1951. Excerpts from some of the letters follow.

Oregon: "Except for such obstacles as may come into the way as a result of federal government controls and restrictions, the outlook for highway construction in Oregon in the year 1952 is very good. We are entering the year with $18,000,000 of work under contract and our plans call for the contracting of an additional $28,000,000 during the year.

"Shortages of steel and other materials will prevent our contracting and performing as much structural work as we normally would and may slow down progress on other classes of work to some extent, but we do not believe that the result of such shortages will be too serious.

"In our opinion, the comparison between asphaltic concrete pavements and portland cement concrete pavements is not materially changed by reason of new information available. For some time the cost situation has definitely favored the asphaltic concrete type.

"Oregon has used granular bases under both asphaltic concrete and portland cement concrete pavements for many years. Our specifications are not presently giving increased consideration to the use of such bases, but during recent years we have increased the thicknesses of such bases to provide the increased strengths that are being required by increasing volumes of heavy truck traffic."

A Rocky Mountain state: "Under the present method of allocating critical materials, the outlook for highway construction in 1952 is, in our opinion, rather dreary. Construction programs must essentially be geared to available materials, and our present information is that a number of critical construction materials will be in short supply.

"We have no indication of a shortage of cement in our state at this time, but the steel shortages are already seriously handicapping our program.

"We have, for a number of years, placed increasing emphasis on the use of granular bases and subbases."

Nebraska: "The dollar value of new construction to be contracted in Nebraska in 1952 will probably be some $2,000,000 below the 1951 total of approximately $12,000,000.

"Steel and cement shortages will not be too critical; we propose an elastic program, making use of materials not in short supply, anticipating that steel and cement will again be in good supply in the fourth quarter of 1952 and we hope in 1953.

"Nebraska is undertaking a rather extensive program of resurfacing concrete pavements with asphaltic concrete. To date our experience with this type of work has been good. Nebraska has a large mileage of asphaltic pavement which has been giving good service where design is adequate for soil and traffic conditions.

"During the past year we have materially increased the use of granular subbases."

Vermont: "Reduced state appropriations for the period July 1, 1951 to June 30, 1953 will restrict our construction program during 1952.

"Cement and steel shortages definitely will handicap our work, as is true throughout the entire country.

"In Vermont, virtually all of our pavements are bituminous types. These are cheaper than concrete, and stand up better in our climate mainly because they do not react to the chemicals used for ice control in winter. At present, we are covering our older concrete pavements with bituminous mixtures at a rate of about 35 miles a year.

"We are using more crushed gravel and rock for stabilized wearing surfaces on gravel subbase, in place of the former double tack coat of bituminous material directly on the subbase."

A Midwestern state: "Because of an extremely wet and cold construction season an unusually large portion of our construction contracts is being carried over for completion in 1952. The amount of 1952 construction funds will be approximately equal to the 1951 construction funds so that the actual volume of work underway in 1952 may possibly be greater than actual construction in 1951.

"There was no shortage of cement in 1951 and as far as we are able to determine at this time the availability of cement will not affect next year's program. Our bridge construction program is seriously handicapped because of the lack of steel and at the present time there appears to be no prospect of relief from this handicap in time to affect 1952 construction.

"Our construction program includes a sizable amount of both asphaltic pavements and portland cement concrete pavements. Most of our asphaltic surfaces are developed on a stage basis with the wearing course being provided a year or two following completion of the base and interim mat."

Washington, D. C.: "In general, our highway program has not been curtailed in dollar volume, however, there is a tremendous backlog of work in part due to the rapid growth of Washington and the nearby communities and in part due to work needed but necessarily delayed during the past emergency.

"It is believed that critical materials will present a problem and be a factor in the speed of execution of the program.

"The department is stressing the importance of an adequate base for pavement construction and is using a carefully controlled granular soils ma-

Construction of modern express highways and grade separations throughout the country will continue to provide a growing market for aggregates and cement, although shortages of critical materials such as steel may delay some projects

terial. (PRA classification A-1) for a minimum thickness of 8 in. under all high type pavements."

South Carolina: "It is estimated that approximately $40,000,000 should be available for construction in 1952. Greater consideration will be given to grading projects in view of the critical shortages of certain materials.

"Because of the steel shortage, the construction of concrete culverts and bridges will be greatly handicapped. Not having had a shortage in portland cement this past year, we do not anticipate one in 1952 for our requirements.

"It has been our experience to construct asphaltic pavements and portland cement concrete pavements in certain parts of the state, depending upon drainage, soil, and climatic conditions. There will be no change in this plan during the coming year.

"In recent years greater consideration has been given to the use of granular subbases in the construction of our primary and secondary roads. Our specifications will give increasing consideration to the future use of such bases."

Virginia: "The outlook for highway construction by the Virginia Department of Highways for 1952 generally is considered good at the present time. Some construction projects, however, will be held up due to a lack of trained personnel and materials.

"Regarding shortages of cement and steel, this department now has under contract enough projects to take up all of the structural steel allotments into the fourth quarter of 1952, if the department is allocated no more steel in the remaining quarters than was allocated in the first quarter. There is an apparent shortage of cement, with some attendant delay, but to date all requirements have been met."

A Southwestern state: "The outlook for highway construction in 1952 is that the volume will be the same or probably 10 percent less than last year.

"It is definitely anticipated that shortages of cement, steel, and other materials will slow down our operations.

"Our specifications do give continued and increasing consideration to the use of granular subbases."

Wyoming: "Barring further restrictions because of the defense effort our outlook for highway construction in 1952 will parallel quite closely our last year's program.

"At present in our area there appears to be no appreciable shortage of cement but steel will, of course, be in short supply and will undoubtedly be a handicap to an effective program. Projects that will require a minimum of steel are being selected for next year's construction.

"Our specifications are giving increasing consideration to the use of granular subbases. Designs are based on the California bearing ratio method and we make use of available granular subbases wherever possible, thus reducing the thickness of the more expensive crushed rock and crushed gravel bases necessary to satisfy our design requirements."

Mississippi: "On our state highway system work for the year 1952, we anticipate an approximate $14,000,000 expenditure presuming that the steel situation materially improves. On our state aid system we anticipate an expenditure of approximately $7,000,000-$8,000,000 provided the material situation does not continue to delay projects involved in this program. These amounts will undoubtedly be reduced, if some miracle does not happen, as a result of the steel situation, in which we would naturally defer bridge construction.

"We do not anticipate any cement shortage. Recently a new cement mill has been completed in this state and it is felt that no serious delay will be encountered in securing the cement for our program. We do anticipate difficulty and delays in securing steel for our bridges."

Connecticut: "In reply to your questions on the probable highway construction program and the effect of shortages of material in Connecticut, it must be pointed out that it will be impossible to carry on the program which was contemplated for 1952 within the present allocation of steel for highway purposes. Several projects which were originally scheduled for 1951 have been deferred and those projects which require structural steel are being postponed or, in the case of minor structures, redesigned to reduce or eliminate the use of structural steel.

"The highway department proposes to continue construction to the extent possible under its allocation of steel and will advertise projects for grading and drainage as well as those paving projects which can be constructed with relatively small amounts of steel.

"There is no indication at this time that Connecticut's program will be delayed due to any shortage of portland cement.

"Our standards call for the use of bituminous pavements on the lower traffic volume highways and for the use of either bituminous pavement or portland cement concrete pavement on highways serving the higher traffic volumes. In general, Connecticut's high volume highways and expressways are paved with reinforced portland cement concrete."

Nevada: "We expect about the same amount of highway work in this state in 1952 as we have had for the last several years."

Washington: "This department will attempt to put under contract about $36,000,000 worth of highway construction work in 1952.

"Severe shortages of cement in this

(Continued on page 190)

Shown here are nodules, made from stock dust and corrected for chemical content by clay slurry, as fed into kiln at Permanente Cement Co. plant

By EROR NORDBERG

Progress in Cement Manufacture

Technical advances have affected all phases of production, with greatest emphasis on improved fuel and labor utilization

THE AMERICAN PORTLAND CEMENT industry has invested something like one-third of a billion dollars for plants and equipment since the end of World War II. It continues to enlarge productive capacity at a high rate. To date, during the postwar period 11 new mills have gone into production; a twelfth will start operations in 1952.

This new capacity has increased national annual productive capacity of portland cement possibly by from 15 to 18 million barrels, which actually represents only a small part of the total increase. Expansion of existing plants, rebuilding and modernization probably have combined to add three or four times that much additional potential capacity.

The practice of expansion of existing plants has always been traditional in the cement industry because of limitations on the availability of raw materials and high costs of new plants. Investment requirements for new mills at today's prices are three times what they were in average years before the last war and the cost is now something like $7 per bbl. of annual capacity. The turnover of capital takes 2½ years or more, so the course of action logically is to improve or enlarge existing plants unless economic conditions favor a new plant in anticipation of attractive future markets. Some of the older plants now have two or three times their prewar capacity.

Our figures as presented here are rough estimates and are based on our own knowledge of installations of rotary kilns, principally. Any estimate is hazardous because there are many variables that enter into the actual capacity of a mill. Other considerations than kiln clinker production as such, including the balance between clinker production and clinker grinding capacity; types of cements manufactured; enlarged output resulting from improved raw material grinding and instrumentation; maintenance and other factors reflect in actual sustained output of cement. Distribution facilities, the availability of transportation equipment and uninterrupted labor supply are essential in getting the cement to consumers.

While the potential capacity of the industry is greatly in excess of prewar capacity, much of the expenditure of the past six years has been for better performance, both with respect to quality of product and operating efficiency. Substantial investments in many cases have been principally to reduce unit cost rather than for enlarged output.

It is our purpose in this article not to detail the various installations and enlargement of the industry, which has been done in previous issues of ROCK PRODUCTS, but to stress development of the industry from the point of view of technical progress and improved methods of production. Much of our discussion will be around progress in 1950 and 1951 when much of the new facilities came into production.

The industry had a net mill realization of $1.46 per bbl. in 1940. In 1950, the figure had increased to $2.36 per bbl. However, in considering the year 1940 as a base, 1950 dollars are 50-cent dollars, so in effect the industry in 1950 realized considerably less per bbl. than in 1940, and it also has for 1951. When the cost of real estate and equipment is included it is reasonable to assume that 1950 dollars were worth no more than 50 cents.

The fact that the industry has been able to increase capacity in efforts to meet record-breaking demands, while receiving comparatively less per unit of production and without going into debt to do it, is a tribute to management and ingenuity in production. That it could be done with greatly inflated fuel and labor costs can only mean that production has been materially improved with expenditures for new mills and modernization.

Lone Star Cement Corp. dry process plant at Lone Star, Va., is of "L" design for economical material handling and represents advanced practice in mill operation

There have been sound developments, production-wise, not only in new plants but in many of the older plants which have undergone extensive modernization and which, for all practical purposes, have been practically rebuilt. The same is true within mill departments of other plants, where rebuilding has been of more modest proportions.

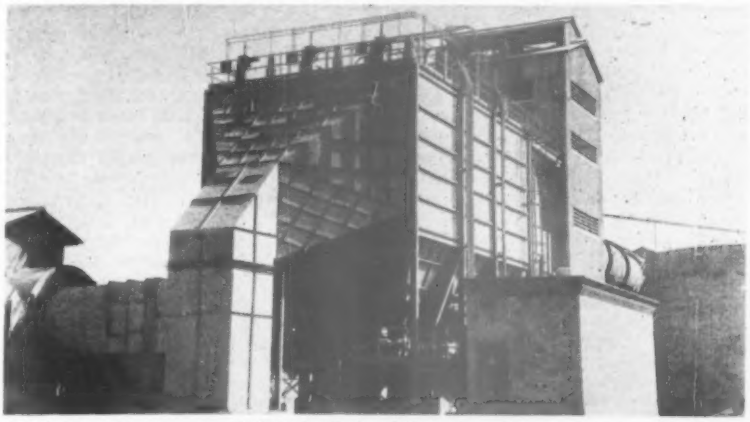
All phases of production, from quarrying and crushing operations on through to packing and distribution of cement, have been re-examined with a view to better operation and with stress on product improvement. Emphasis has been on the elimination of many of the deficiencies as they existed and on the balancing of outputs of the raw mill, kilns, finish mill and packing departments for more continuous production throughout.

With the installation of hundreds of rotary kilns since the last war, raw mill and finish mill capacities have had to be adjusted upward accordingly and through the addition of considerable new grinding equipment. Supplementing new equipment for increased capacity, important increases have resulted from improvements to details of operation which have contributed much toward continuity of production.

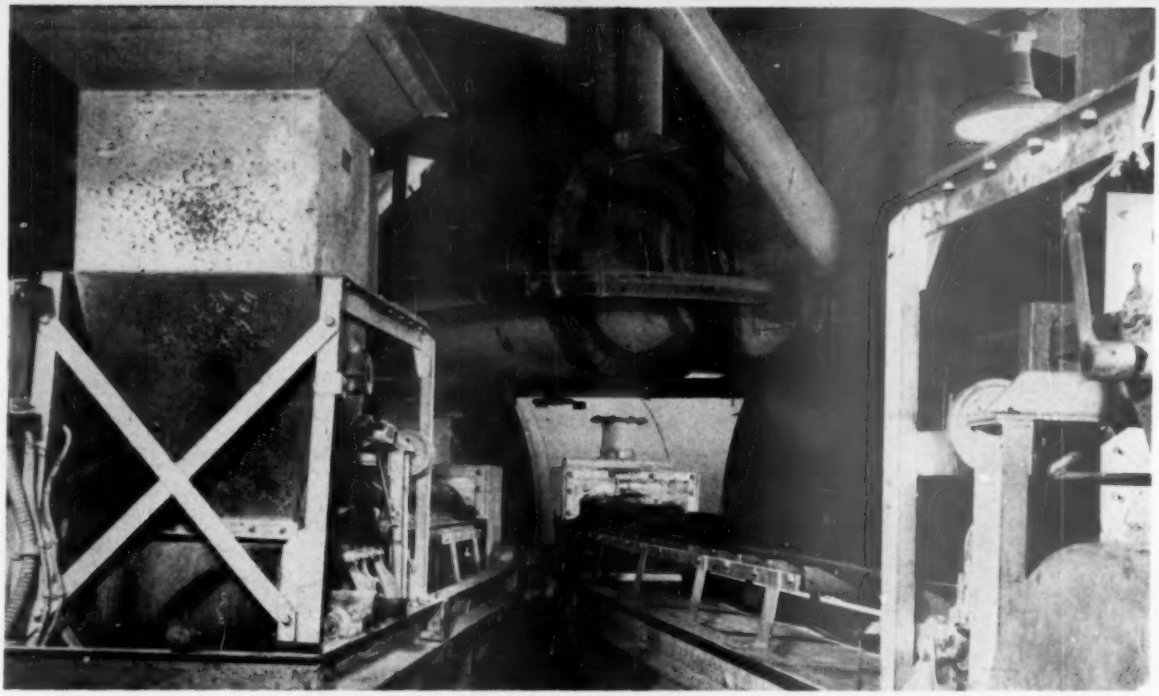
General Trends

Among them are improved methods of feeding materials into mills and kilns, closed-circuiting of secondary crushers with vibrating screens for more regulated range of particle sizes as fed into raw grinding mills, the increased application of control devices for kiln operation, the installation of clinker crushers ahead of finish grinding mills, greater application of closed-circuit grinding operations throughout, new methods of dust recovery and material handling, and the considered application of production experience to minimizing breakdowns.

The foregoing are representative of some of the trends in production which have added immeasurable but substantial increases to plant output, and to reduced unit costs simultaneously with improved product. One of the largest mills in the world reported, a year ago, that production at that time had been increased by 90 percent since the end of the war. New equipment was responsible for 75 of the 90 percent increase and general tightening of the various operations contributed the other 15 percent, which amounted to a half million barrels annually alone. That is representative of the less spectacular developments that have been taking place and which



Combinations of cyclone-type stack dust collectors followed in series by electrical precipitators are a means of segregating dusts for purposes of re-use or disposal



Grinding operations are featured by accurate proportioning feeders like these, both for raw material grinding and clinker grinding

have contributed much toward minimizing losses of production due to breakdowns. Postwar operations will be able to maintain production that will closely approach potential capacity.

Dry vs. Wet Process

In addition to the foregoing general trends, there are pronounced trends taking place which will be discussed throughout this article. Among them is a growing interest in long dry process kilns of high capacity. Both new plants of Lone Star Cement Corp., at Lone Star, Va., (see ROCK PRODUCTS, August, 1951, pages 112-116) and at Maryneal, Texas, have 10- x 340-ft. dry process kilns, and there have been other such installations in 1951 and 1950. In one mill, a 390-ft. dry process kiln has gone into production alongside short waste-heat kilns and, in another plant, a long dry process kiln has recently been fabricated by joining two shorter ones. Dragon Portland Cement Co. now has three 9- x 314-ft. dry process kilns at Northampton, Penn., and Riverside Cement Co. has 10- x 350-ft. dry process kilns at Oro Grande, Calif. The largest in the world are two 11- x 400-ft. units that recently started operations in Greece. Several conversions from wet process to dry operation have been made.

Until these installations of long dry process kilns, the trend in recent years was almost entirely in the direction of continually longer wet process kilns. In either case the main objective is fuel economy but the wet process was preferred because it has always been recognized that thin slurries could be blended to yield a much more uniform material for kiln feed. However, the perfection of special pneumatic and mechanical blending devices for raw materials and, in some cases, the installation of blending tanks that consist of a large number of conventional individual units of modest size with flexible arrangements for handling and intermixing between, has made it possible to approximate the holding point of some slurries. Characteristics of the raw materials must be such that they lend themselves to uniformity when blended by such a dry process.

It may be anticipated that there will be more of the long dry process kilns installed in the future because they offer great potential savings in fuel, but the trend, according to numbers of actual installations, is still heavily in favor of wet process kilns. Most of the newer plants since the war have been wet process and, at least in one case, a plant was entirely converted, in 1950 and 1951, to wet process principally to eliminate dust. Except for special cases where economics dictate short kilns with waste-heat boilers for increased capacity in existing waste-heat plants, most of the newer kilns are in excess of 320 ft. long and with diameters of 10 ft. or more. The average length is near 375 ft. but we have many kilns in excess of 400 ft. and one that measures 12 x 500 ft., at Kingsport, Tenn., (Penn-Dixie), which is the largest in the western hemisphere.

High fuel costs are responsible for the adoption of long, large diameter kilns in the cement industry, and for many auxiliary developments related to the operation and firing of kilns which are discussed later in this article. Waste-heat boiler installations with short kilns have been limited to such existing plants and no new waste-heat plants have been built because the economics from long-kiln operation justify the purchase of power in view of the high prevailing installation costs for waste-heat power.

Among other outstanding developments other than those already mentioned, there has been a tremendous expenditure for dust collection. Objectives are to prevent the escape of dust into surrounding communities and farms, to improve working conditions, prolong life of expensive equipment and to recover valuable dust for reprocessing.

Plant Design

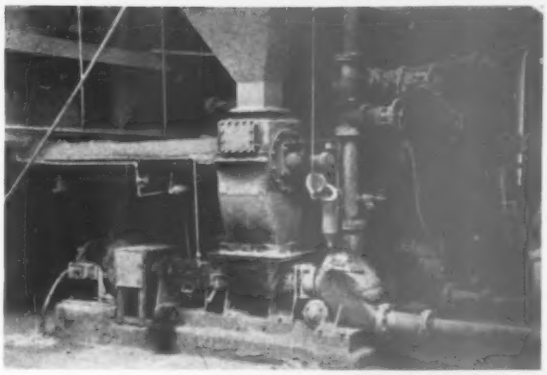
The entirely new plants are of well-integrated design and permit fullest use of technical advancements. They are built to balance all the separate mill departments and to operate each for optimum results from the others. Other mills have been modernized with that view but must continue to compromise because of sometimes unalterable limitations.

Housekeeping, maintenance and freedom from dust within and without, have dictated the design of new

mill buildings. As typified by the Lone Star, Va., plant and the Missouri Portland Cement Co. plant at St. Louis, Mo. (ROCK PRODUCTS, August, 1951, pages 127-135), they are designed to prevent the escape of dust, with few windows if any. Dust control is emphasized inside and these buildings are clean and pleasant surrounding in which to work. Individual dust collectors are in operation at sources of dust generation and the Lone Star mill, for an outstanding example, has 18 bag-type dust collectors at strategic locations. The grinding mill building in this case is actually under slight suction and is kept spotlessly clean.

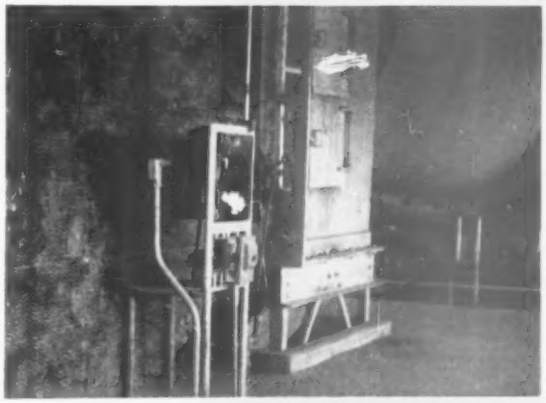
Lighting and ventilation are being emphasized, as are roominess and safety features to permit easy maintenance and to promote high efficiency of men as well as machines. Kiln hoods, mechanical air separators and other sources of high heat radiation are being insulated for the same reasons. Labor-saving devices and methods to eliminate drudgery jobs are being emphasized. Refractory brick and sacks are being handled on pallets by fork lift trucks; we now have elevators to high places and use more power hoists for handling heavy equipment and parts. Change-houses, shower rooms, individual lockers, lunchrooms and various recreational facilities for workers are being provided to an increasing extent, and in the older plants as well. With the rapid technical advances in the industry through more refinements of processing, instrumentation and automatic controls, the industry must attract and hold a better class of worker and it is recognizing more all the time that continued progress depends upon making the cement mill a very desirable place in which to work.

New plants and those which in effect have been rebuilt are leaning toward an "L" design pattern, and a large centralized covered storage area for all raw materials and clinker located for low-cost material handling. The Lone Star mill and the Mason City, Iowa, plant of Lehigh Portland Cement Co. (ROCK PRODUCTS, August, 1951, pages 144-152) are good examples. Both the raw grinding and finish grinding departments are in a single mill building adjoining the long covered storage area, for ready transfer of the materials by overhead crane into conveniently located mill feed bins. The kilns comprise the other leg of the "L." Among the exceptions are older plants where space limitations or an existing "H" or straight-line design make it necessary to store raw materials separately from clinker and gypsum. Several such plants now have a compact arrangement in which clinker is stored in a row of silos for ready transfer and proportioning on a reclaiming belt conveyor below and then delivery by bucket elevator into

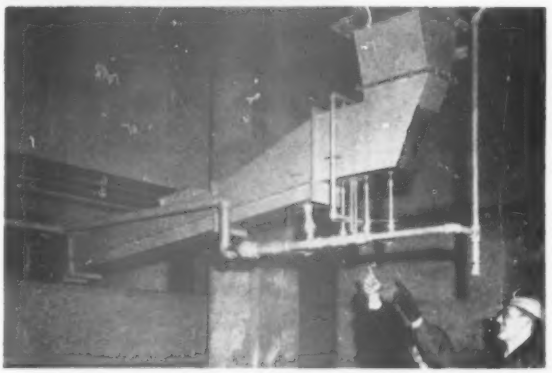


All the dust reclaimable from stack gases is here accumulated into a bin and pumped directly into feed ends of raw mills for reprocessing

Bin level device on air-activated gravity conveyor carrying air separator rejects illustrates the great adaptability of such conveyors to process control. Here, the mill in circuit with the air separator is stopped when the level device indicates that the low pressure air conveyor is fully loaded

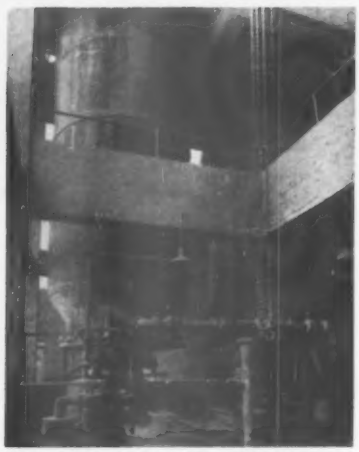


Continuous oxygen analyzers are becoming widely used as a measure of air and fuel utilization for best efficiency



A combination of air-feeder and low pressure air conveyor is shown here in the transfer of cement from a silo for elevation into a packaging machine bin. Devices such as this have many advantageous features and are finding widespread application

Missouri Portland Cement Co., St. Louis, Mo., grinds clinker in two stages, the preliminary mills being in closed circuit with electrically-vibrated screens and the finish mills being in open circuit



Continuous double-tank homogenizer for blending of dry-ground raw materials. A combination of fluidization by air under pressure and mechanical agitation combine to blend materials uniformly

overhead mill feed bins. Cooled clinker from air-quenching clinker coolers, which have been installed in practically all mills, has made this possible. It is apparent that no stock is being placed in the value of aging clinker in any plants today.

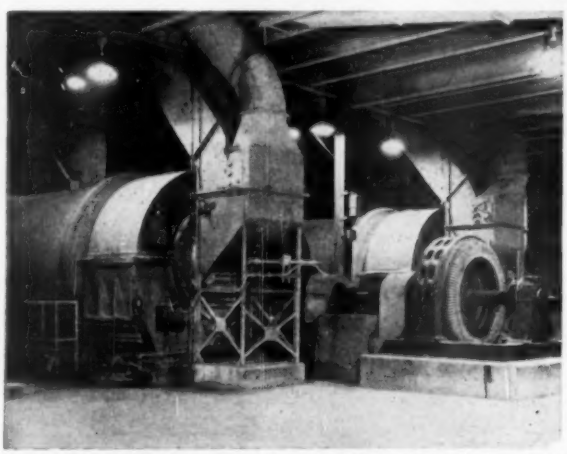
Newer plants have anticipated the possible future need for expansion and their layouts provide for it. They are leaning to duplicity of operations whereby each kiln has its own related equipment from the firing end right on through to having separate stack dust collectors for each. Similarly, the grinding circuits are in duplicate. Thus, a single finish mill unit may be operated, or separate clinkers be processed simultaneously. Major equipment capacities were chosen so that a single unit would not be critical to continuity of operations, with adequate capacities so that a grinding mill, for example, can regularly be taken out of service for maintenance, according to plan, without affecting operations adversely.

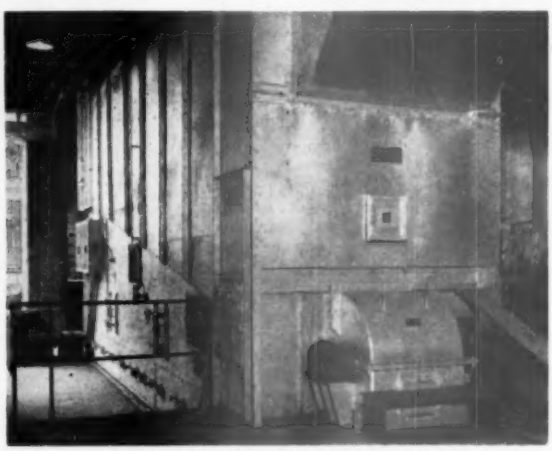
Maintenance is being given increasing attention and, in some of the installations, has been a major factor responsible for rebuilding, as one way to bring a mill up to standard costwise. At Mason City, Iowa, Lehigh Portland Cement Co. replaced much of the equipment and converted from a low-water wet process to a dry process plant to reduce excessive maintenance. The slurry had proved very corrosive on equipment. Air tools are finding use in the removal and tightening of nuts and bolts as effective maintenance tools. Other ways to reduce maintenance are a consideration in most of the separate mill functions discussed here.

Crushing

Most cement mills renovated their quarry operations in the first years following the war, the principal tendency being the greater use of rubber-tired equipment. Primary crushing capacity has had to be enlarged in many cases with the conventional installations of gyratory and jaw crushers in most cases. During 1951, a Pacific Coast manufacturer installed a 60-in. gyratory crusher which is one of the largest of this type in operation. Several plants have focussed attention on more controlled regulation of truck discharge into primary crushers such as remote-control, push-button activation of pneumatic dumping mechanisms.

The hammermill continues to be the preferred secondary crusher because of its great ability to produce fines. Operation of these units is now being governed for best operation of raw grinding mills in the conservation of power. Accepted practice is to op-





Left: Lehigh Portland Cement Co. has installed air-swept mills like these (Mason City, Iowa) in three plants for grinding raw materials. Sizing is done in overhead air classifiers and the final product recovered in cyclone collectors. Right: This air-quenching inclined-grate clinker cooler at Lone Star, Va., is unique in that both primary air and secondary air for combustion in the kiln are preheated from the hot clinker. Note clinker chunk breaker

erate the hammermills, sometimes without grates, in closed circuit with vibrating screens to accomplish better particle size range for efficient grinding. It is effective in eliminating the critical oversized particles which are detrimental to best grinding efficiency and also in holding down fines to lighten the dust load for the grinding circuits. Top size of feed for milling is being held to ⅝ or ½ in., as compared to the ¾ in. standard of a few years ago, which permits the use of smaller grinding media in the mills.

Raw Grinding

In grinding raw materials, better output per unit of power input is being accomplished through such a closely controlled range of sizes within narrow limits in the feed material which permits more selective sizing of media. At Missouri Portland Cement Co.'s plant where a 10-ft. 8-in. x 17-ft. mill is in closed circuit with a rake and bowl classifier followed by thickeners to receive the overflow, a controlled size of feed has led to grinding capacity far in excess of the rated figure. By size regulation that eliminates any oversize feed into the kiln, an 83 percent through 200-mesh product has been proved a satisfactory material for uniform kiln operation. This contrasts with an average raw material fineness of from 90 to 94 percent minus 200-mesh for the industry. The mill in this case was expected to produce 58 t.p.h. but actually is turning out 75 t.p.h.

Incidentally, at this wet process plant, a separate mill is operated in open circuit to produce high lime, iron and silica slurries for purposes of interblending with regular-run slurry in adjusting the chemical balance. An interesting detail is that slurry pumps have grease seals rather than water which creates a vacuum on the suction side that is an aid to emptying the basins from which they are fed.

In general, whether dry process or wet, practice is toward more closed circuit grinding for reasons stated, of producing products sized closely within narrow limits which reflect in advantages with further processing. This is true in clinker grinding also. Apparently, compartment mills are coming into wider use for their advantages in size selection of grinding media.

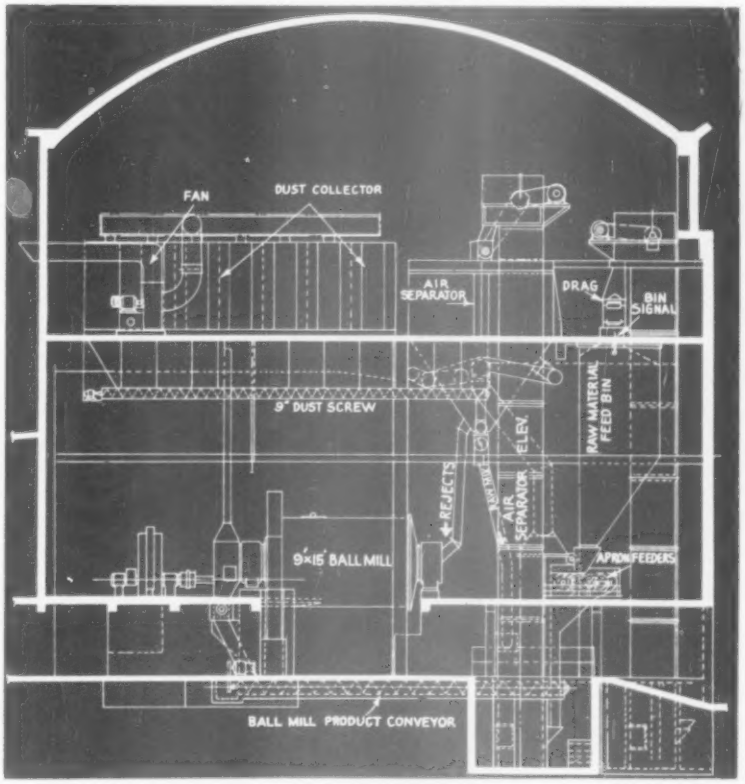
Medusa Portland Cement Co., at Silica, Ohio, in converting to the dry process, is installing two B&W ball-bearing type grinding mills similar to those installed at the Dixon, Ill., plant several years ago (see ROCK PRODUCTS, November, 1948, page 82). These mills are each closed-circuited with mechanical air separators and heated air is supplied by a stoker-fired furnace and swept through the system for drying simultaneously with grinding.

Among other single circuit systems of special interest is the one used at Lone Star's mill at Lone Star, Va., which consists of two 9-ft. 6-in. x 15-ft. ball mills each in closed circuit with a 16-ft. mechanical air separator. Feed is directly into the air separator and the rejects are fed into the ball mill, which minimizes over-grinding and by-passes acceptable material. This circuit saves power as a result and eliminates excesses in fines to the kilns which is a particular advantage in dry process kilns where every effort is made to cut down stack dust losses. Another advantage is that circulating loads are held not to exceed 300 percent. Heated air is supplied in the air separator from a separate furnace and the system is exhausted through a bag-type dust collector. Production is 30 t.p.h. for each circuit in grinding to 92-94 percent minus a 200-mesh sieve. Ducts from the furnace, elevators, screw conveyors and air separators are covered by mineral wool blankets for heat insulation, and each air separator has block insulation overhead as an aid to workers in maintenance and adjustments.

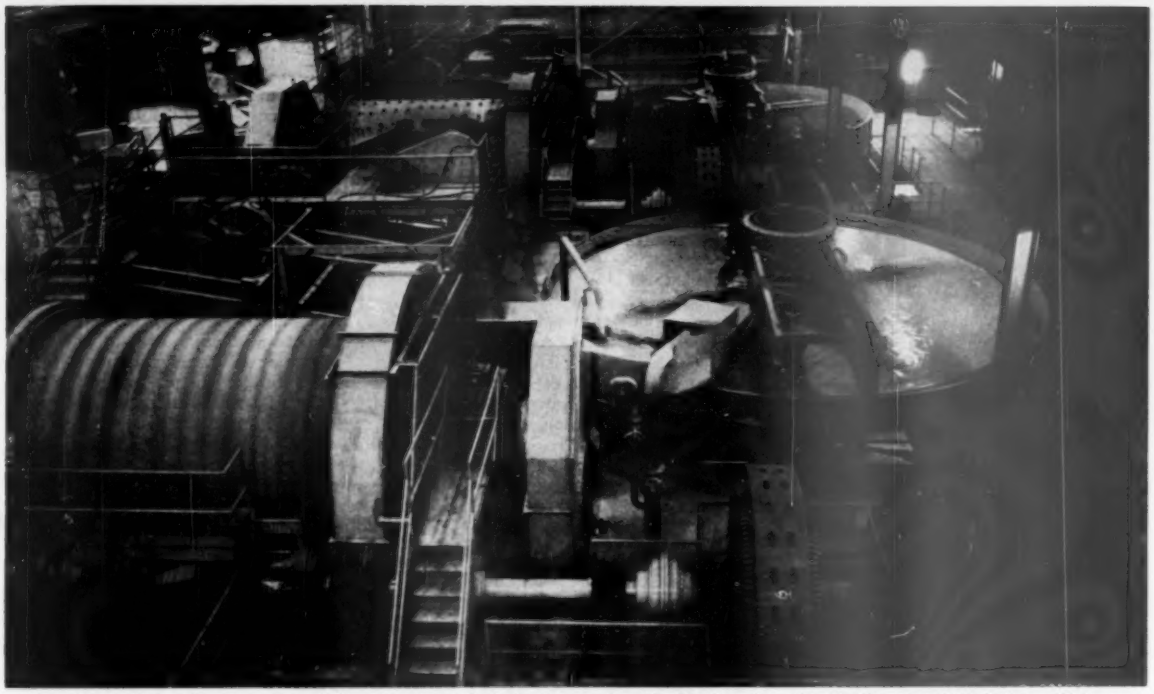
Lehigh Portland Cement Co. has air-swept tube mills for raw grinding at Metaline Falls, Wash., Fordwick, Va., and Mason City, Iowa. At the latter mill, similar equipment is used for preliminary grinding in the finish mill. Each of these mills is in closed circuit with radial flow, adjustable air classifiers as contrasted to mechanical air separators. Rejects are returned to the mill in each circuit and the fines are collected in cyclones. Air swept through the circuits is preheated by a separate furnace. Circulating loads are about 350 percent and the power requirement is about 7 kw. per bbl. (Details of operation are covered fully in ROCK PRODUCTS, August, 1950, pages 136-144, and in August, 1951, pages 144-152.)

At Mason City, Iowa, classifying liners are used in the mills consisting of a series of short frustums (of a cone) with larger ends facing the feed ends of the mills. This arrangement causes the larger balls to concentrate at the feed end and the balls to grade downward progressively in size toward the discharge end. This liner, which was first described in ROCK PRODUCTS, April, 1938, pages 44-46, when in the experimental stage, classifies balls according to size over the entire length of the mill and, through its use, permits charging the balls into the discharge trunnion without regard to size.

These particular mills are driven at 20 r.p.m. by 900-hp. low-starting torque synchronous motors, direct connected



Sectional elevation through raw mill at Lone Star, Va. Feed is to air separators and only the tailings are ground, thus minimizing the load on the circuit and improving mill performance



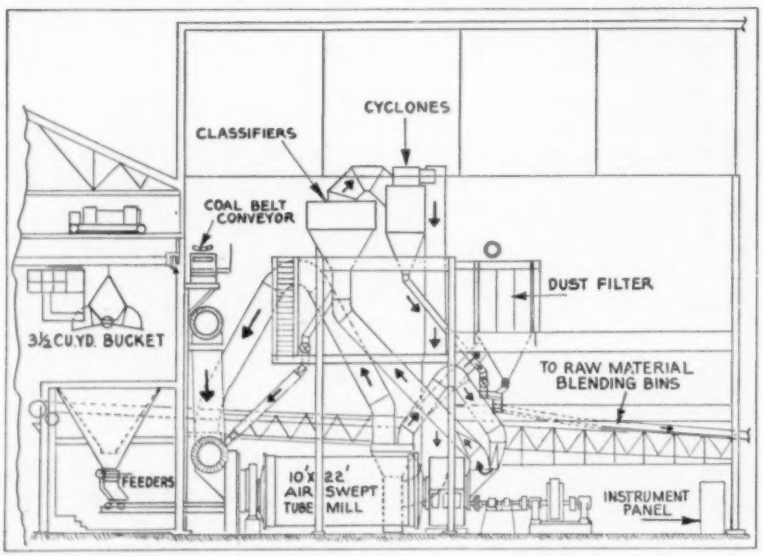
View of a modern wet process, raw grinding department featuring large unit mills. Overflow from the classifiers is settled in large thickeners

through two stages of gearing consisting of a high-speed pinion driving an intermediate large gear on a shaft from which a pinion engages the mill gearing. A reduction of 600:20 is thus accomplished through a drive that is simple and low in maintenance and which builds to full speed smoothly under full load.

At some plants, grinding mills have been specified of extra heavy sections particularly for points of previous failures and the ratio of shell length to diameter has been specified to be below the point where failures have occurred in the past. Among other features in newer installations are interlocking feeders that maintain accurate proportions, weighing and recording feeders, starvation switches and other devices for accuracy of control.

Blending

In all of the major building programs, blending of raw materials has been given special emphasis, for attainment of uniformity of product and of kiln performance. Great progress is being made in the attainment of uniformity of materials, both physically and chemically, and uniformity of flow throughout production as means to yield much greater average output, to increase kiln refractory life and to conserve fuel and power. Blending of raw materials to a stable holding point is of greatest value in rotary kiln operation, particularly where the kilns are of great length.



Elevation of a raw mill in which the grinding mill is air-swept and sizing done by air classifiers

Blending in dry process operations is becoming highly developed and particularly where there are kilns in excess of 300 ft. length, which require great uniformity of feed for optimum performance. Inability to accomplish accurate blending has, in the past, dictated against long dry process kilns in favor of wet-operated kilns. Small deviations from a definite composition holding point have important undesirable effects on uniformity of product, burnability of raw materials and kiln economy, which are multiplied in long kiln operation.

There have been several installations of special pneumatic arrangements in connection with long dry process kilns which apparently are effective in blending. These homogenizers take advantage of the fact that finely pulverized materials will behave like a liquid when mixed with air applied under pressure through the bottom of a bin. They are tanks with cone-shaped bottoms through which the air is forced upward, and

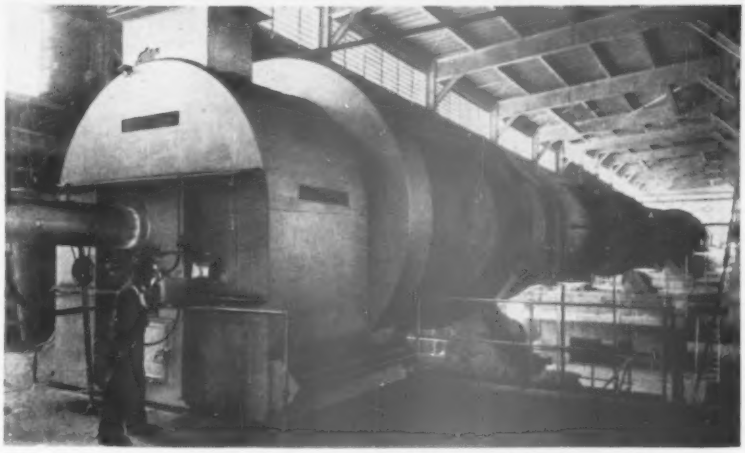
also have a mechanical rotating device for agitation, simulating what is being done in the blending of thin slurries. According to tests that have been made, in a particular plant, the variation from a specific $CaCO_3$ holding point was reduced to $\pm$ 0.15 percent as compared to a range up to 5 percent without the use of air and mechanical agitation.

In other plants, highly developed systems for circulating dry raw materials between numerous silos have been installed. Good examples are the systems used at the Lone Star mill at Lone Star, Va., and the Mason City, Iowa, mill of Lehigh Portland Cement Co. There is greater use of continuous samplers in connection with these arrangements, to check incoming material, the blend and again as material is released for kiln feed.

A brief description of the blending set-up at Mason City will suffice as an example of new practice. In this particular plant, a system of double-blending is employed using air-activated gravity conveyors and bucket elevators for transfer. There are two parallel rows of five bins for raw material storage and two separate rows of three bins for blended material. Combined, there is sufficient supply for three days of kiln operation.

A 14-in. air-activated conveyor moves raw material from the mill for elevation overhead into another low pressure air conveyor from which any of the ten storage bins is filled by manipulation of appropriate gate valves. A continuous sample is taken from the low pressure air conveyor ahead of the elevator, drawn from a short length of screw conveyor fitted to the previously mentioned conveyor. Thus, an average sample is obtained for analyses of oxides, C_3S, MgO and silica ratio.

A blend is made by simultaneous drawoff from any combination of bins to two parallel common air-activated conveyors and elevated into either of the blending bins. A sample is continuously taken as reblended material from the blending bins is withdrawn for conveying to the feed ends of the kilns. In arrangements such as this, variable speed drawoff rotary feeders and the ability to combine materials from any combinations of bins and place them into any selected bin give great flexibility. There are variations in other plants, using screw conveyors instead of low pressure air conveyors, but all of them provide for interchangeable handling and rehandling between multiple bins.



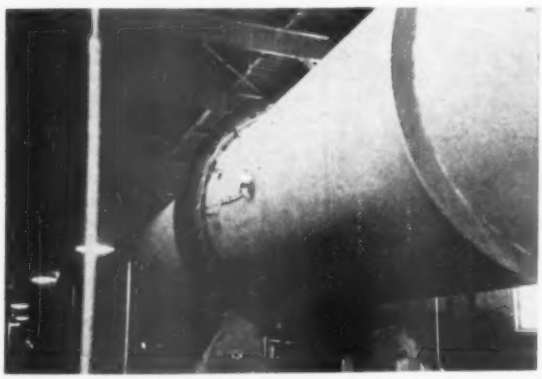
This 11- x 375-ft. wet process kiln at Dewey Portland Cement Co.'s Davenport, Iowa, plant is representative of most recent practice. The hood is tight fitting and insulated and the kiln has a dual drive with helical gears. Instrumentation is highly developed for this kiln

Kilns

Whereas there is a growing interest in long dry process kilns because of potential savings in fuel, the majority of kilns installed since World War II are wet process units ranging in length from 320 ft. up to the 12- x 500-ft. kiln of Penn-Dixie which is described in a separate article in this issue. There is great variation in sizes, outputs and in fuel requirements. Among the kilns with which we are familiar or which we have seen in operation are the following:

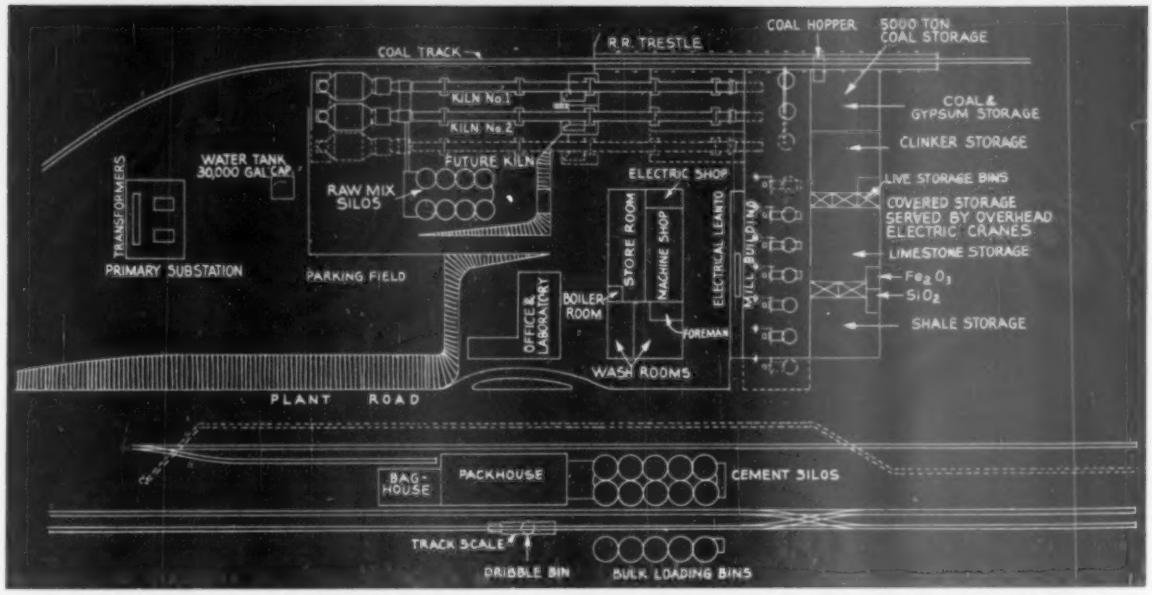
Size	Process	Production, bbl. per day	Fuel consumption, B.t.u. per bbl.
9 ft. 6 in. x 377 ft.	wet	2000	1,200,000 (52 percent slurry)
10 ft. x 340 ft.	dry	2000	1,000,000
11 ft. 3 in. x 295 ft.	dry	2600	1,000,000
12 ft. x 475 ft.	wet	5500(+)	(A Swedish installation)
11 ft. x 375 ft.	wet	2400	1,000,000
11 ft. x 400 ft.	dry	2500	850,000 (Greece)
11 ft. x 400 ft.	wet	—	—
11 ft. x 375 ft.	wet	2400	1,000,000
11 ft. x 356 ft.	wet	—	—
9 ft. x 314 ft.	dry	—	—
11 ft. 6 in. x 360 ft.	wet	—	—
11 ft. x 230 ft.	dry	—	waste-heat
12 ft. x 500 ft.	wet	4200	1,000,000
12 ft. x 450 ft.	wet	—	—
11 ft. x 375 ft.	wet	—	—
11 ft. 3 in. x 470 ft.	wet	—	—
11 ft. 3 in. x 450 ft.	wet	—	—

The foregoing list is by no means complete and is intended only to point out the wide range in sizes of the newer long kilns. In addition there have been a number of kilns 140 ft.



Thermocouples are being installed at critical points in kilns as a control practice. Here is shown a take-off from which the temperature is continuously recorded on the instrument panel

A modern operating panel has all instruments and controls for the entire kiln operation centralized on one board. The instruments are in a dust-tight cubicle



Plant at Lone Star, Va., is of "L" design, making for a compact layout and one which minimizes the handling of materials

or 150 ft. in length installed in waste heat plants to increase production. There is no standardization according to size and the variations in production and in fuel requirements are difficult to justify on the basis of diameters and length of kilns. The long kiln in Sweden has internal refractory tile and planetary coolers which explains, as least in part, its high production.

It is of interest that in at least three wet process plants there have been 11- x 375-ft. kilns installed, but we know that, in the case of one of them, length was determined purely by property limitations. In a second, length was limited to the available funds appropriated, so it is apparent that fuel considerations and output were not the sole determining factors in their selection.

Production listed for the various kilns does not necessarily determine potential productivity since the figures are for normal production in some cases and are larger by comparison in others because kilns are being forced. One of the 11- x 375-ft. wet process kilns, for example, is rated at 2400 bbl. daily capacity under normal operating conditions whereas its forced rating is 2800 bbl. but with a sacrifice of 250,000 B.t.u. per bbl. A reasonable conclusion is that long kilns, whether wet or dry process, are reducing fuel consumption from 200,000-400,000 B.t.u. per bbl. for individual plants as compared to pre-war operations.

Long kilns have proved more economical to the industry in combination with purchased electrical power than shorter kilns with waste-heat boilers, for new installations, in view of the high capital investment currently required for power plant equipment. This trend, due to economic conditions, has permitted the independent operation of kilns for efficiency in burning clinker whereas, in the operation of waste-heat boiler combinations, there was usually the compromise between running a rotary kiln as an efficient clinker machine and purchasing supplemental power, or over-firing to develop waste heat.

However, modern waste-heat installations, of which there have been a considerable number, are much more efficient than they were a few years ago because improved steam turbines are in the range of 30 percent more effective in converting steam into electrical energy.

The two 11- x 230-ft. rotary kilns of Monarch Cement Co., at Humboldt, Kan., are of special interest because, in combination with existing waste-heat boilers, the design was for self-sufficiency in electrical power for the entire plant and so that the kilns may be operated at maximum efficiency in burning clinker. It was decided to install efficient dry process kilns which would exhaust less heat than shorter, less efficient kilns and to supplement power by a direct-fired auxiliary boiler with a great margin of reserve to meet any anticipated demand for power.

It was a case of balancing production and kiln economy against the ability to generate steam. The kilns were designed to exhaust gases at 1400 deg. F., which would develop steam for 80 percent of plant power load and the kilns are operated to produce clinker at 1,050,000 B.t.u. per bbl. Heat recovery was calculated at 340,000 B.t.u. per bbl., sufficient to generate 18 kw.-hr. per bbl., which required an additional 5 kw.-hr. per bbl. to be generated by operation of the auxiliary boiler. The boiler is rated at 40,000 lb. of steam per hr. at 750 deg. F. and can develop steam from the constant rate of 5000 lb. per hr. which is held, to 30,000 lb. per hr. in 30 minutes.

All of the recent long kiln installations follow a common pattern but there are differences in operating methods and in details. Each is fed

Chain section of a kiln being lined with castable refractory. Kiln hoods, dust chambers and air-quenching clinker coolers are being lined with such refractories

raw material at a controlled rate from a feeder which has a drive synchronized with the kiln drive, whether wet or dry process; discharges clinker over an inclined or horizontal air-quenching grate-type clinker cooler from which heated secondary air for combustion in the kiln is derived; is highly instrumentalized; direct-fired (if coal is the fuel) from a ball-bearing type unit coal pulverizer or air-swept tube or ball mill; and exhausts through various types of dust collectors, with induced draft fan on the suction side, to a stack. Wet process kilns have chain sections in every case.

Control of firing conditions is commanding great attention and it has become essential to minimize air leakage at the ends of the kilns in order for firing to be done under more closely controlled conditions. Tight-fitting hoods to minimize air leakage fluctuations and floating-type air seal connections where the feed ends of kilns project into their dust chambers are becoming common.

Kiln feed openings are being restricted for improved draft control and nose rings are being air-cooled to keep the castings from over-heating, flaring out and breaking. Another means of preventing these failures is to have nose rings of chrome-nickel alloy castings. Kiln hoods at the Missouri Portland Cement Co. plant in St. Louis, Mo., are built so they may be removed by merely loosening four bolts. Then, fork lift trucks enter with pallets of refractories for relining the kiln shell.

Application of castable refractories is gaining in use for lining clinker coolers, kiln hoods and dust chambers, which are being insulated to reduce heat radiation in these working areas. There are also kilns which have a lining of abrasion-resistant castable in chain sections and there is at least one installation of high heat resistant castable on the hot edge in kiln hoods. Castable refractory materials come in bags and are mixed much like ordinary concrete. They are quickly applied, simplify the hanging of heat exchanger chains and have the advantage of convenience.

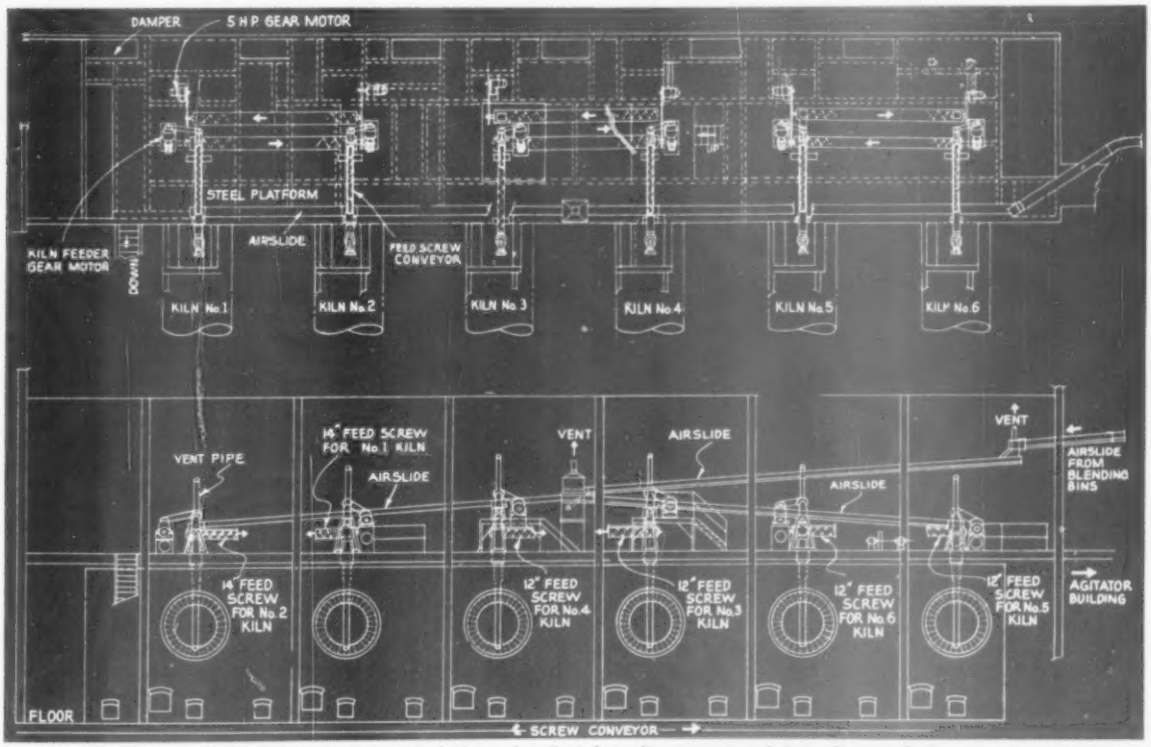
With few exceptions where magnesite refractories are used in the hot zones of kilns like at the Missouri Portland Cement Co. plant, standard practice is to line the hot zones with 70 percent alumina brick of 6 in. thickness and to follow with various combinations of 50 percent and 40 percent alumina brick for the balance of a kiln. Some wet process kilns have special high silica abrasion-resistant linings through the chain section or standard low-temperature firebrick and, in at least one kiln, there is a lining of ordinary slag concrete.

Kiln Drives

Among developments in kiln drives is the adjustable speed dual drive helical gear which was first applied at the Davenport, Iowa, plant of Dewey Portland Cement Co. on an 11- x 375-ft. kiln and which has since been installed on several kilns recently. The drive at Davenport consists of two 60- to 70-hp. d-c (230 volt) motors, with speed range of 300-1200 r.p.m., each of which drives through Texrope, a pinion which engages the ring gear. The motors are balanced through rheostats and a Texrope-driven generator synchronizes rate of feed to kiln speed.

In this drive, the driving pinions are staggered and vibrations are damped. There is a perfect contact of the gear teeth and jerking or walking of the kiln is eliminated which results in quiet, smooth performance. Pinion gear bases are movable for easy adjustment of clearances between the gear teeth. If one side of the dual drive fails, the other drive permits operation at reduced capacity.

A brand new development in the cement industry is application of the Dynamatic water-cooled, eddy-current coupling in driving the 12- x 500-ft. kiln at Penn-Dixie's Kingsport, Tenn., plant. In this coupling, the input member is driven at constant speed from the motor and there is no mechanical connection to the driven member, the transfer of power being through magnetic attraction between the two in the development of torque. The drive lends itself to automatic variable speed control from a constant speed power source and is described in some



Kiln feed system at Mason City, Iowa, is comprised of an air-activated gravity conveyor and draw-off screw feeders to each of six kilns

detail in a separate article in this issue on the Kingsport plant where it is used also for other applications requiring variable speed.

Kiln Feed

All the newer wet process kilns have ferris wheel, bucket-type slurry feeders which have their drives synchronized with the kiln drive. Refinements are in electrical indicators on the burner instrument panel which show whether or not an overflow is being continuously maintained as an indication of uninterrupted flow. In at least one plant, the design of the feeder requires that buckets be added or removed in varying the ratio of slurry delivered per kiln revolution to prevent easy or frequent changes in this ratio.

In dry process plants, constant-head feeders are coming into more use. In a particular installation, material is drawn by a rotary feeder from the feed bin into a system of circulating bucket elevators and screw conveyors which deliver into the constant-head feed box which has an overflow weir. A proportioning feed screw in the weir box is driven through an electrical synchronous tie to the kiln drive motor. Feed is delivered into a kiln spout. Constant rate of feed is assured through keeping the feed screws full, and excesses overflow into the feed bin for recirculation.

At Lone Star, Va., material from the constant head feeder is spouted into a 12-in. diameter cast iron kiln feed screw projecting through the exhaust gas dust chamber into the kiln. Feed is thus introduced right on the load in the kiln, on the load side, so that the end of the pipe is not enveloped by gases. Purpose is to minimize dust losses.

At Lehigh's Mason City plant, unique use is made of air-activated gravity conveyors in feeding raw materials into the kilns. Blended material is elevated and transferred to a 14-in. vented air-activated conveyor from which six kilns draw their feed. There is an overflow weir in the housing at point of transfer for overflow of excess material not absorbed by the kilns, into a bin. The low-pressure air conveyor is the "water-level" type and is kept completely full of material. A split is made to two legs, from each of which material is drawn for three kilns and fed in by means of an inclined feed screw conveyor followed by an open-top deaerating screw conveyor for each kiln.

Firing of Kilns

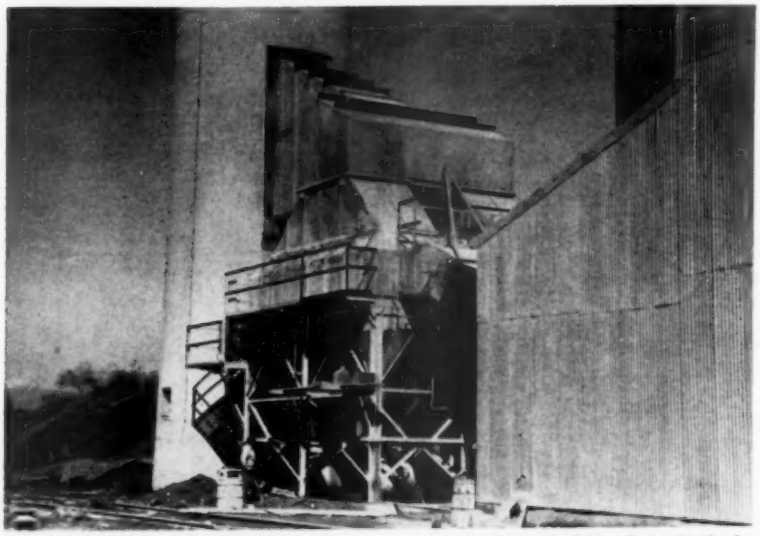
Efforts to improve the firing of long kilns are apparent throughout in all of the newer installations, emphasis being on methods of operation to maintain controlled uniformity in kiln operation. All manufacturers of cement have found the long kiln to be a much more sensitive piece of equipment to operate than short kilns and, as a result, great progress has been made toward minimizing conditions that lead to fluctuations in loading with their detrimental effects on fuel economy, quality of product and refractory life.

Instrumentation is fulfilling a prominent role and many of the kilns have automatic control features for firing variables that formerly were responsible for deficiencies. However, there exist great differences in opinion as to the best way to operate kilns and as to the value of certain automatic control devices. While practically all the newer long kilns are highly instrumentalized, many of the instruments have not been in full use, as to their automatic features, even a year after installation because it takes time to train burners in their effective use. There are cases where men are purposely employed as burners, who have had no previous experience as burners, so that they might learn their trade exclusively from their experiences with instruments. In other plants instruments that are designed for the control of firing variables are being limited so far to use as indicating devices until experience is gained. Obviously, there will be many firing variables put under automatic controls in the early future.

A few years ago there was a definite trend started in the direction of high kiln speeds and the average was approximately 75-85 r.p.h. (it was 60 r.p.h. or less ten years ago) with a high in excess of 100 r.p.h. in one plant with which we are familiar. More recent installations indicate that there is a tendency to somewhat more conservative speeds with an average in the 65-75 r.p.h. range. It is assumed that economics and possibly quality of product considerations have led to the reversal. Fuel costs have continued up, which likely has led to the need for operating kilns at best economy which is not attainable when kilns are forced and, of course, long expensive kilns must justify themselves in fuel savings and are capable of great economy of fuel. Long kilns like the 12- x 500-ft. unit of Penn-Dixie were selected in order to have sufficient capacity without being forced. Newer long dry process kilns are being operated at about 50 r.p.h., for best uniform travel through and to hold down stack losses. Large stack losses are a problem whether all or part are returned into a kiln and, if any quantity must be wasted, present a difficult problem in disposal.

As to whether or not it is more favorable to hold long kiln speeds constant while varying the firing rate or to maintain firing variables constant and compensate for load fluctuations by varying kiln speeds, the preference is leaning toward the maintenance of uniform kiln speed if possible. In those cases, practice is to change kiln speed only under unusual circumstances of load where it is desirable to slow or speed up a kiln in the range of ten percent. This would be done if a mud ring develops, for example, that would reflect in marked temperature change just below the chain section as indicated by a thermocouple. For short kilns with waste-heat boilers, some manufacturers prefer to make compensating adjustments to kiln speed as the easiest method and as a safeguard against secondary combustion in the boilers.

Direct-firing mills of both the roller-bearing and air-swept tube mill type have been installed, in either case drawing preheated air from the kiln hood for drying coal and injecting the primary air-coal mix into the



This is the first successful installation of a commercial hydraulic stack dust collector in the industry. Much of the dust is first precipitated in a dust chamber, the balance is sluiced to waste

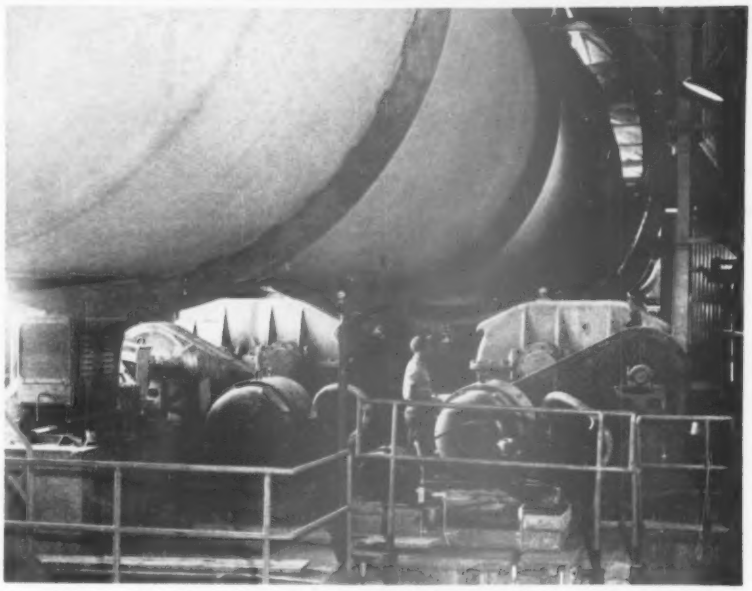
kiln at approximately 180 deg. F. Preheated air is being introduced into air-swept tube mills, through insulated pipe, at temperatures as high or higher than 600 deg. F. A recent installation of a direct-firing, roller-bearing type of mill is the first which has a high efficiency dust collector to trap clinker dust from the heated air pipe ahead of the mill.

An exception to the general practice is the method used at Lone Star, Va., where preheated air to be swept through bowl mills, for coal grinding, is drawn not from the kiln hood but out of the grate-type clinker cooler from a point where temperatures are 400-450 deg. F. This is done so as not to draw out combustibles which reduce the O_2 in the primary air, and to eliminate fogging at the hood. Air velocities are also minimized through the hood. Secondary air for combustion is drawn simultaneously from the hot end of the cooler at 1300-1500 deg. F., which by itself is conventional practice in virtually all new installations. Interesting details are that the coolers are mounted off-center from the kilns, on the load side, for even clinker distribution and that the throat opening between the cooler and the kiln hood was designed as large as the hood. This was done to hold velocities to a minimum or there would be fogging due to dust pickup All this adds up to uniform distribution of air at the flame through elimination of turbulence and to the elimination of dust which is, of course, detrimental to heat exchange. Hoods are insulated too, which minimizes losses of high level heat.

Newer clinker coolers, which are of both the inclined and horizontal air-quenching type, have roll or hammer-type clinker chunk breakers at their discharge ends, and they are under automatic controlled operation to various degrees. In a typical installation, the grate is driven by a variable speed motor as a means of control of flow of preheated secondary air up through the clinker bed and into the kiln. Secondary air flow is held constant by automatic regulation of the grate speed through measurement of the clinker bed resistance pressure. A constant bed thickness is maintained by a pressure switch controller which changes the cooler grate speed by means of a rheostat in the field current of the d-c cooler drive. Varying the cooler pressure reflects in the volume and temperature of air, as a means of adjusting firing conditions.

Instrumentation

All firing controls are centralized at a panel on the kiln firing floor and practice is to have the highly sensitive instruments enclosed in dust-free cubicles. Among the instruments in most common use are recording optical pyrometers for continuous measurement of temperatures in the hot zone (usually as measured on the lining), a continuous recording pyrometer for kiln exit gas temperature and dust collector temperature, a recorder and controller for the cooler bed speed, coal mill temperature recorder and controller, gauges for both hood and back end drafts, continuous recorders for gas temperatures as measured by thermocouple at one or two selected points within the kiln, and continuous oxygen recorders.



Adjustable speed dual drives with helical gears like this, shown driving an 11- x 375-ft. rotary kiln, have been installed in several plants. Jerking and walking of kilns are eliminated, resulting in smooth operation

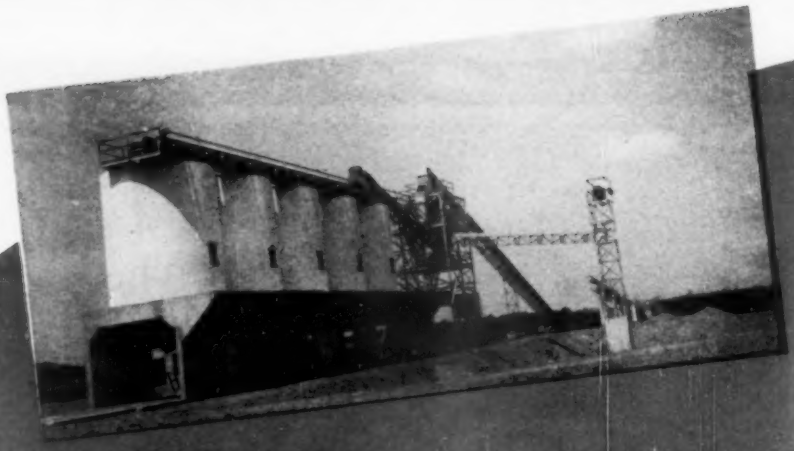
In addition there are ammeters and switches, flickering lights and other indicators for all equipment associated with the kiln, all centralized at the control board.

Interest in continuous oxygen analyzers and the application of thermocouples for gas temperatures at critical points in the kiln is growing and more use is continually being made of them. These instruments, of several makes, are sensitive and there is only a time lag of a few minutes from the analyzer at the back end of the kiln to registering the reading on the instrument at the kiln operating floor. They thus quickly indicate shortages of fuel and, assuming that a clean accurate sample is taken, may be used as the control basis for operation of other instruments. They are an indicator of excess or insufficient air and are being used insofar as practicable to reduce excess air to approach a zero-zero theoretical reading for O_2 and CO. To reduce CO to a trace, practice is to hold the O_2 from a minimum of 0.5 percent to 1 or 2 percent, which would be from about 2 to 5 or 10 percent excess air.

At some plants it is not mandatory for the burners to use the instruments and only those considered essential have been provided; in others, complete reliance is on instrument operations. Among the automatic controls being used increasingly, in addition to the clinker bed speed control mentioned, are completely automatic draft control for either the hood or back end and sometimes through pressure differential, with automatic drives for the purpose on louver dampers, automatic tempering of the heated air for drying coal as controlled by the coal-air mix at the kiln burner pipe, and, in at least one mill, the hot zone pyrometer will be hooked up for automatic regulation of the feeder to a unit coal mill.

An increasing number of wet process kilns are being equipped with thermocouples located just in front of the chain section as a measure of the slurry consistency and they are proving effective in the elimination and control of mud rings. An established reading, as determined by samples and moisture determinations, is a measure of consistency and this reading, once established, is held to maintain that moisture which is proved best for a particular slurry. It is also an effective precaution against burning out the chains. A sudden rise in temperature, of about 100 deg. F. or more over the established figure, usually around 1200 deg. F., indicates a starvation of feed due possibly to a mud ring or might indicate too dry a slurry. A similar drop in temperature would indicate too high a moisture content. Use of a thermocouple so located indicates when the rate of firing or draft requires change or

(Continued on page 201)



A modern crushed granite operation in the Southeast. A 90 ft. long platform scale under the silos is an unusual feature

Quality Stressed by Aggregates Producers in Plant Operations

By WALTER B. LENHART

THE FINAL END for much of the sand and gravel used in the United States is in concrete. Concrete production and sand and gravel production are becoming almost synonymous. Since concrete is usually sold on the basis of strength (and not so much with emphasis on durability and overall performance), the lack of uniformity and durability in concrete, during the past several years, has caused the spot-light of publicity to be focussed rather sharply on the aggregates. Therefore, much of the data to follow should be of interest to producers of all types of aggregate.

There was a time, only a few years ago, when the major concerns of an aggregate producer were to wash his materials adequately and to screen them as specifications required.

During the past few years (particularly in 1951) many processes that were quite a long time in reaching maturity have been accepted by some aggregate producers and have been incorporated into the newer plant designs.

The gradual, and sometimes rapid, depletion of some of the older sand and gravel deposits, increased freight rates, shifts in population and other trends in combination with more recent concepts of mineralogical content of aggregates, reactivity, staining of concrete from iron-manganese minerals, "pops," physically unsound aggregates and thermal incompatibility mean the producer often is faced with a different set of conditions. To cope with them adequately, his thinking almost from necessity has to include the visualization of separatory processes and various methods of beneficiation being added to his more conventional screening and processing operations.

Fortunately, the subject of thermal incompatibility of aggregates is not taken as seriously as it was in the last year or two, and if emphasis is put where emphasis is due, thermal incompatibility in the future will become just another legend, as it should.

However, where the sand and gravel contain variable (to small) amounts of objectionable materials, either organic or inorganic, the specification writers will gradually alter the picture so that elimination of the objectionable materials will be a definite requirement.

Depletion of deposits and freight rate increases will probably play the more important roles in this shift from simple screening and washing to more elaborate beneficiation processes. Materials formerly considered objectionable, in specifications as written, will be made acceptable by the removal of the objectionable fractions. This objectionable material runs the gamut from old shoes through clays, shales and coal to unwanted rocks and minerals. It may prove more economical to open a new pit, employing modern technological processes, than to be subjected to freight rates that in most cases are becoming much higher than the dollar value of the aggregates being shipped. Freight rates for many years have averaged more than the value of the product and the pronounced trend upward has also had the effect of encouraging new competition to established plants when contracts fall in high-freight districts.

This past year has been an interesting one. It is an easy year to write about as it was filled with applications of new ideas and techniques, and because of the success of most of these applications it has been demonstrated that no matter what the separation problem might be there is available a method of making that separation—often well within the economics imposed. Certainly the increased freight rates make it economically possible to adopt new practices that add modestly to unit costs.

Prospecting Methods

There has been great interest in prospecting methods. Commercial-grade sand and gravel deposits are not as widespread as the layman supposes, for nature has concealed them with burdens of soil and vegetation. Various methods of prospecting are being used that range from drill rigs with a cutting lip on the bottom of a bucket which serves as the rotary drill head, to more scientific geophysical prospecting methods.

We encountered the first mentioned prospecting drill idea three decades ago. At that time the method was being used to drill cesspools in southern California. Geophysical prospecting has been in vogue by oil companies for 20 years or more, so we have found its application in the sand and gravel industry either in or near oil producing areas. There are literally dozens of exploratory engineering firms which use geophysical techniques. One has simply to get a newspaper published in oil producing sections to find advertising columns full of names. Geophysical prospecting is unquestionably fast, and it can be relatively cheap. Its accuracy, on the average, is reliable but a great deal depends on individual skills.

Before becoming too involved in the general subject of beneficiation it might be well to discuss briefly some important trends that may accent the need for more and more beneficiation.

In the United States a large company, interested in the production of concrete, organized a subsidiary "to

Challenge is to meet specifications by processing more materials from available deposits

Dry screening of masons sand over single-deck screen at Don C. Russo plant, Rochester, N. Y.

Alleged "reactive" aggregates continue to present a problem to producers in some sections. The pile at right (below) is all wasted because it is said to contain reactive aggregates. About 40 percent (all minus 2-in. material) of pit-run material is wasted at this operation

study aggregates." In its scope, this organization could rank with the Bureau of Reclamation and the U. S. Army Corps of Engineers. The new research company has hired some of the most competent and experienced concrete technical brains available to head its new organization. Whether right or wrong, it may indicate a trend to put still more emphasis upon aggregates.

Some older producers of sand and gravel with years of excellent performance records, and some producers who are only now getting clear of technical entanglements caused by controversial theories, may be in for more of the same if the trend should become more general.

Reactive aggregates, or "reactivity," is a phrase that is more and more frequently being applied to all types of aggregates. Its action is somewhat clouded in mystery and we fear that aggregate producers accept reactivity in its entirety, even though, in our opinion, much of the emphasis on reactivity is a myth. It may take a little time and courage but when we learn that reactivity of aggregates is being taught in some of our public schools it probably is time to draw the line.

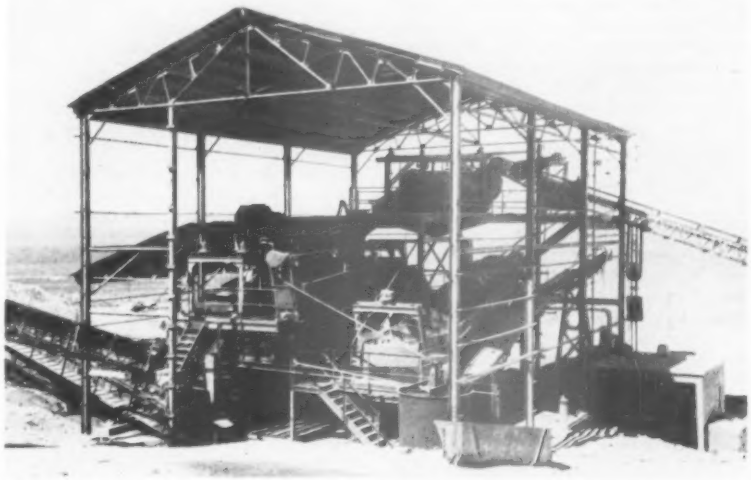
The damage incurred by a sand and gravel producer due to reactive aggregate is spotty, geographically speaking, but the damage does exist. During the year we have endeavored to run down a few deposits rumored to be reactive. We were somewhat surprised to find that in one section "reactivity" referred to "pops," in another it was iron-manganese minerals which stained the concrete; even dried mudballs in gravel were called reactive. All expansion and contraction phenomena were reactive, almost by definition, regardless of the cementing agents used, and finally the family of minerals classed as opalite were claimed to be reactive.

Identifying Minerals

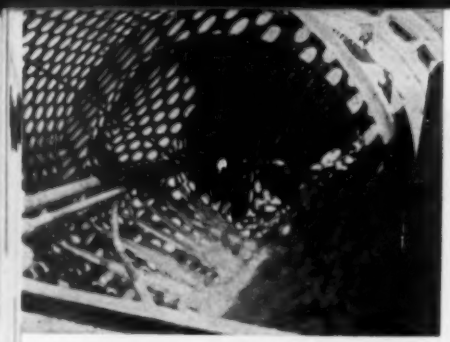
Before any attempts are made to explore the subject, it is our opinion that someone should define accurately and clearly just what is a reactive aggregate. If it is the opaline group of minerals the next step should be to tell us exactly how to identify it. When that has been accomplished the engineering fraternity can lend its skill to devise methods of removing the objectionable ingredient. At present, the tests we have are time-consuming and are based on a chemical test of a bulk sample with no means of fractionating out, or identifying, that part which is harmful.

With this in mind we have been exploring the possibility of using an ultra-violet light so as to identify reactive materials quickly and easily. From necessity, our research was confined to field or pit examinations, and it was crude and superficial. But we did receive enough encouragement to feel that the inclusion of fluorochemistry in the study of aggregates and concrete may develop some valuable and interesting facets. Our exploration into the use of fluorochemistry as a means of identifying obscure rocks and minerals, supposedly harmful to concrete, has enabled us to say definitely that the identification of opalite can be expedited by ultra-violet equipment. A survey of a pit with this light (best accomplished at night with portable equipment) can: (1) isolate the opalite, since it may be present only in certain zones; (2) find the opalite confined to, or concentrated in, certain size ranges, or (3) find no opalite at all in a deposit that has been condemned because of suspicions.

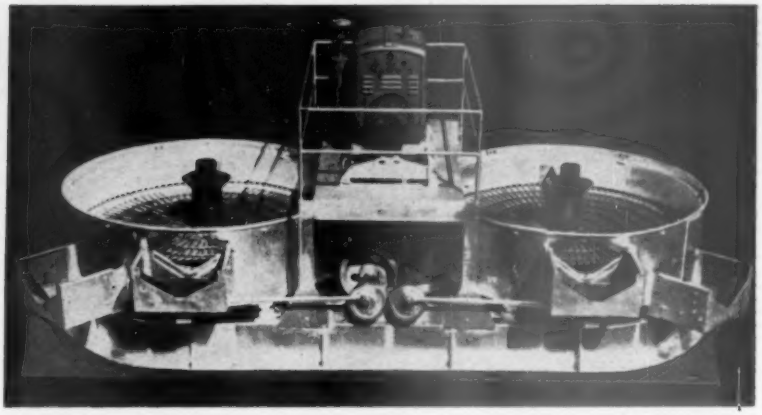
We are also cognizant of the fact that Potomac river aggregates (as an



This new HMS plant in the West for processing magnesium rock shows the compactness of such installations



In the Far West several new installations use rotary scrubbers to remove clay. The success of this installation stems somewhat from the large amount of oversize in the drum



A washing, screening and classifying plant used successfully on manganese-clay ores may offer possibilities to aggregate producers in the removal of clay. The picture shows the grid-covered fine screen in the screen tank, where it will be submerged several inches below the water level when in operation. All material to be abraded and screened forms rolls which continually roll over above the baffles separated from surging water from below the screen. Eccentric connections (connecting rods in center) when in motion cause the tank to oscillate back and forth, and curved races and rollers cause an up-and-down motion

illustration) have been superficially examined by ultra-violet equipment and, when they were found to contain a host of materials that fluoresced, the work was considered discouraging because there were no means of identifying each of the rocks that did fluoresce. Practically all oils fluoresce. There are said to be some 10,000 chemicals that fluoresce. Some chemicals in solution, diluted even to one part in four million, will react. Many rivers have been the dumping ground for industrial waste and probably some of the fluorescence can be traced to this source. The amount of published material applying to this subject is not great and there appears to be a lot of room for research. It is the sole purpose here to review the data compiled so that some research organization will take up the subject and do a real job. For example, we know that some calcites will fluoresce, others phosphoresce (continue to glow in total darkness), and still others will not react at all. In fact, some calcites interground with portland cement are said to be beneficial. Which calcite is better?

We include this brief mention of ultra-violet equipment mainly to illustrate the trend toward a more scientific approach to sand and gravel production. In a sense, we have already located the deposits by geophysical methods, have learned some of their mineralogical content and, obviously, would apply standard tests to the aggregate to learn its physical characteristics. In the following data we will review some of the beneficiation and separatory processes emphasizing what we believe to be new so that acceptable aggregates can be processed.

The use of air-entraining agents has become widely accepted, and the belief is becoming general that it will make good concrete out of bad and transpose poor aggregates into good. There is a distinction. Air entrainment aids the cement paste, not the aggregate. Therefore, it follows that if inferior aggregates are used with air-entraining agents the concrete may be improved solely because of the beneficial action on the cement paste.

We are quite impressed with the large amount of literature on concrete and the implied needs for more beneficiation of aggregates, particularly when used with high-alkali cements. The alkali-aggregate reaction is a surface reaction, so the concentration of alkali per unit of surface is an important aspect of this subject. If, in any given case, the alkali per unit of surface is high, the concentration can be reduced easily by increasing the surface area of the aggregate and attempting to hold the total alkali constant. This can be accomplished by the addition of more fines—especially those in the minus 100- and 200-mesh ranges.

Methods of Removing Clay

To the aggregate producer, one of the most common trouble makers is clay. This can range from football-sized chunks to coatings on sand grains. Rotary-type scrubbers, log washers and older similar types of scrubbers have not always solved the problem. In the phosphate fields a high speed vertical, agitator-type scrubber was being tried as a first step in the beneficiation of pit-run phosphate (ROCK PRODUCTS, March, 1951, page 74).

In the Far West three new installations using rotary scrubbers went into service, two on gravel and one on dolomite. Generally speaking, all three were doing a satisfactory job, but as one operator said, "When a chunk of clay as big as a football comes along, I'm in trouble. It goes in, is beat out of shape and comes out almost intact." It was indicated that if the scrubber contained many large pieces of aggregate (6 to 10 in. in diameter) these heavy pieces would pulverize the chunk of clay and eventually reduce it to slime. It is simply another case in ball mill grinding that "the smallest ball should be able to fragment the largest particles." This same theory, in our opinion, refers to rotary-type scrubbers.

One operator, also in the West, was using a system of soak periods that started in the pit itself, with a "soak-surge-pile," and on through the plant (ROCK PRODUCTS, August, 1950, page 108).

Obviously, the disintegration of a large clay ball can hinge on the character of the clay itself. Some clays deflocculate faster than others due to inherent characteristics, and some clays in process continue to flocculate, or grow in size. The subject of artificial deflocculants is a worthwhile project. There are many chemical deflocculants or dispersing agents on the market which are apt to be outside economic reach, but possibly some waste by-products from industrial plants might be available, which at least could be tried.

In a rotary-type scrubber, where lifters in the drum are used, the load of gravel is not in motion constantly and the large chunks of clay tend to ride on top of the muck pile. The duration of actual impact of disintegration media on the clay ball is relatively short and often we find impact on impact by two separate balls causing the growth of a clay ball.

A western inventor has developed a scrubber that is basically designed to (1) keep the aggregate in motion 100 percent of the time, or as near that as possible; (2) separate as quickly as possible the various sizes of aggregate and clay balls in the scrubber, and (3) remove from the scrubber the clay slimes as soon as they are liberated.

This type of machine is a development of W. A. Huelsdonk and was first used in gold dredges in the West and at other metal mining operations. During the pioneering development stages, this scrubber was manufactured at the plant on a custom basis. When experience was gained, a final model was evolved and patents were granted in 1950.

Possibly the easiest way to describe this washer is to say that its

action somewhat resembles a conventional pop-corn popper. At the outset the receptacle was rectangular but it was found that a cylindrical pan was an improvement. As yet there are no installations in the rock products industry but the machine is in successful use on some manganese-clay ores in eastern Tennessee. The scrubber is being manufactured by the W. A. Huelsdonk Mining and Manufacturing Co., Johnson City, Tenn., and the illustration shows one of the twin machines similar to those in use in Tennessee. It has a capacity between 100-200 t.p.h., the tonnage depending on the amount and character of clay in the matrix.

When the tank is in motion, eccentric connections cause it to oscillate back and forth, circularly and up and down. This motion causes violent surging, double oscillating and abrasive movements. Water in the unit keeps the material somewhat buoyant so that wear on the screens is not unreasonable. The space occupied by the machine (including working room) is roughly 20 x 40 ft. and horsepower requirements are nominal. This is one of the newer beneficiation tools available and, basing our statements on actual experience, we predict it will find a large range of usefulness in the rock products industries.

Another device that could be used as a scrubber, one in which the violent movement of the particles approaches 100 percent, is essentially a grinding unit. It employs a new mechanical idea and its operation and performance were described in detail in the February, 1951, issue of ROCK PRODUCTS, page 93. The machine was invented by A. W. Fahrenwald, dean of mining, University of Idaho, Moscow.

The subject of clay removal from sand has resulted in the development of a so-called "attrition machine" that first found use in removing clay, iron oxide, and other surface contaminants from silica sand in industrial sand plants in the West. The machine is a vertical agitator-type unit with specially designed rubber-covered rotating spindles. In the machine the pulp has a relatively low water content and resembles a thick mush. This thick pulp means a rapid and constant rubbing and scouring action on each particle; it does not sand up or stall. It is being exploited by Western Machinery Co. A silica plant to be described in the February issue of ROCK PRODUCTS uses this type of scrubber. A high speed vertical, rotary-type agitator scrubber being used in the processing of ilmenite and rutile was described in the December, 1951, issue of ROCK PRODUCTS, page 92.

Heavy-Media Separation

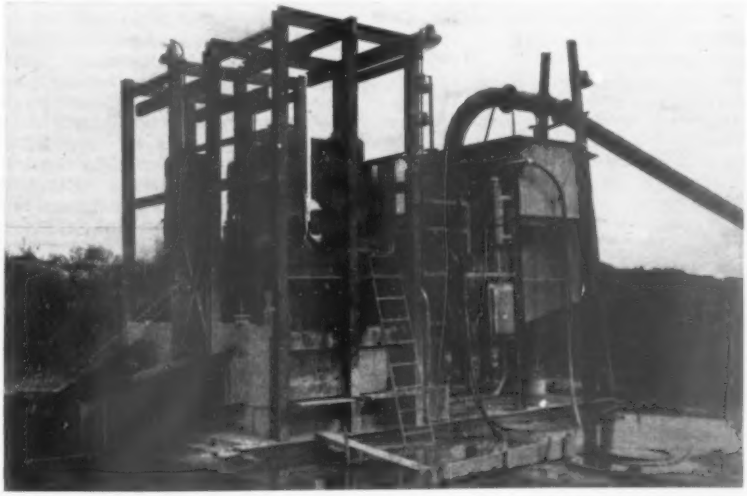
For materials coarser than sand, the major separatory development in the rock products field has been the adoption of the heavy-media separation process by a large eastern sand and gravel producer and the adoption of the process in industries closer to crushed stone operations than to sand and gravel. Early in 1947 the writer visited all the plants in the United States in the rock products field where the heavy-media process was in use. With possibly one exception these plants were all built about that year so were relatively new to the writer and to the industry. These observations were published then (ROCK PRODUCTS, October, 1948, page 100) and since that time the writer has pursued the subject much further, feeling that this is a real separatory tool for these industries at least to know about. Its adoption, in 1951, by a nationally known sand and gravel operation, by a crushed dolomite plant where softer granitic intrusives are being separated from true dolomite, by a plant to recover magnesium oxide (brucite) from dolomite and magnesite, and by a plant now still on paper to separate anhydrite from gypsum, indicates that it is a valuable process.

In the November, 1951, issue of ROCK PRODUCTS, page 64, the use of heavy-media separation was described at the operation of American Limestone Co. in Mascot, Tenn. The parent company, a zinc producer, was the original inventor of the technique.

Heavy-media separation has been called various names: sink-float, float-sink, differential density separation, and "flotation." There seems to be a general opinion that the process should be called heavy-media separation, or simply HMS, and hereafter we propose to use this abbreviated title.

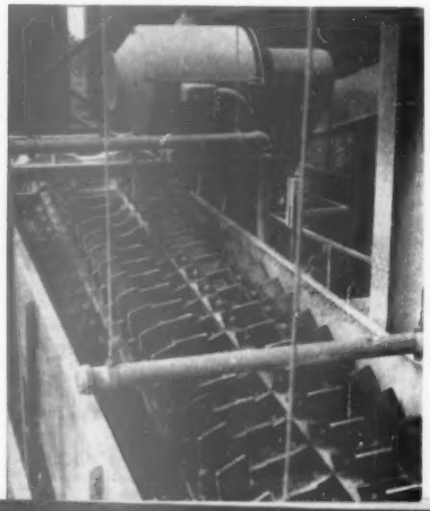
Essentially, the process consists of making pulp using finely ground ferro-manganese or ground magnetite, or a mixture of the two, the pulp having a specific gravity such that heavier materials will sink and lighter will float in it. For instance, a pulp medium having a specific gravity of 2.75 would mean that gravel (at 2.65) would float, and iron-manganese conglomerates would sink, assuming the latter had a specific gravity about 2.85 or higher.

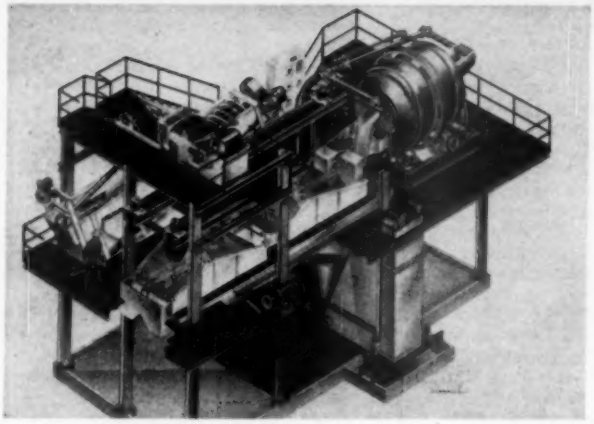
In the earlier processes a simple cone was used, the size of which determined the plant's capacity. These cones ranged from 5 to 20 ft. in diameter. The medium in the cone was stirred at about 2 r.p.m. to assure a homogeneous pulp matrix. Plus 3/16-in. minus 2½-in. rock was fed to the cone by a chute or belt conveyor. The lighter fractions floated and were drawn off, and the heavier fractions sank and were removed by an air-lift. The rest of the process revolved about the recovery of the ferro-manganese and/or magnetite. The reader is referred to the previously men-

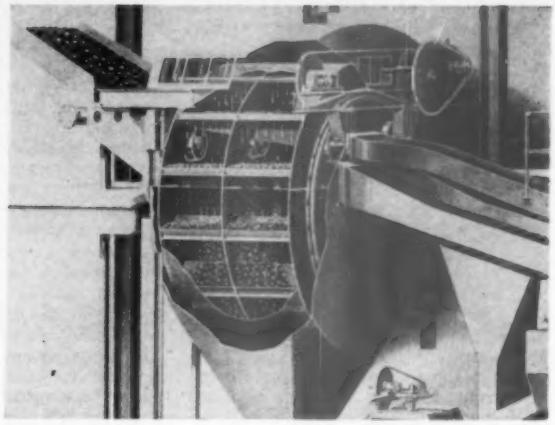


High-speed washers for preliminary treatment of phosphate matrix. The field pumps deliver to the small hopper which in turn feeds the four-agitator "mud hog." The mud hog gives the matrix a preliminary scrubbing

Log washers are still an important washing unit in many plants







One of the beneficiation developments coming into the rock products industry has been the adoption of the heavy-media separation process for the separation of unwanted materials in the production of aggregates. Left: Shown here is an artist's rendition of one of the factory built, packaged plants. Right: A cutaway drawing of a drum-type HMS separatory vessel used in the coal industry which could possibly be used in rock products processing

tioned published data for an explanation of this technique. We intend here only to review briefly some of the newer developments and to point out, if possible, their advantages and disadvantages.

A study of published data will show that to make a continuously accurate separation, the density of the media must be held as near constant as possible. Incoming wet rock may upset the density of the media, so if a small cone is used the variation can be more pronounced than with a large one. Therefore, if the range of differences in specific gravity of the "sink" and the "float" fractions is small, a large cone is used. The cone is possibly the best tool from a strictly metallurgical standpoint, but the removal of the sink fraction by an airlift has its troubles, and a middling product can build up that will neither sink nor float so the cone has to be dumped (usually once per 24 hr.). In addition, if the plant operates only 8 hr. per day, the cone must be kept in mild agitation the rest of the 24 hr., or dumped. However, none of these restrictions is severe, as proved in plant operations.

In an effort to increase the capacity of a unit, especially where the differential in specific gravity is great, the drum-type separatory vessel is finding extensive use. In this process a rotary drum equipped with lifters is used. The ends are so designed that a fairly large volume of pulp is held inside the drum at all times. The feed is introduced into one end. The sink fraction sinks, is picked up by the lifters, and is discharged through a separate chute in much the same manner that concrete is discharged from some types of mixers. The float fraction simply floats out of the end of the machine. Thereafter the process involves the recovery of media.

This type of machine can increase capacities of a cone plant several times (based on the original cost of the plant or on comparative floor space required). A plant of this type went into service in an Alabama iron mine but it is interesting to note that while the sink fraction was iron ore, the float fraction was mostly gravel, and the plant is owned by a man well known as a sand and gravel and crushed stone producer both in Alabama and in Iowa.

Link-Belt Co. has a separatory vessel of the drum-type which has found considerable use in the coal industry. The heart of this system is the tank containing the liquid media and rotating elevator with perforated lifter shelves that delivers the sink fraction to a sink flume. The cutaway illustration gives the essence of Link-Belt's separatory process.

Colorado Iron Works and Southwestern Engineering Co. are exploiting jointly the HMS separatory process that hinges on the use of the Akins spiral to effect the separation of the sink and float fractions. This process enables the operator to take out a middling product continuously. It has found several applications in the Mesabi iron range, in the coal industry, on lead-zinc work and on manganese ores. Southwestern Engineering Co. features a factory-built unit and, at present, these packaged plants range from 50-200 t.p.h. Direct operating costs including media, but without repair and maintenance have been reported to be as low as 2 cents per ton of feed, with installation costs from $600 to $730.

The Sink and Float Corp., New York, N. Y., is one of the pioneers in HMS work and uses the Huntington-Heberlein process. The process uses galena as the medium, which is recovered later by flotation. The company's separator consists of a rectangular inverted pyramidal tank the toe of which feeds directly to a slow-moving bucket elevator, the buckets of which are usually perforated. Pre-built, packaged plants are in use in the fluorspar and metal mining fields. The separator is said to operate without clogging, and at low costs that are compatible with tonnages treated.

Before leaving the subject of HMS we should not overlook the possibility of its use to separate clay balls. One pit owner in the Dakotas is planning on its use to remove iron concretions from gravel. We also wish to point out that the first HMS plant in the world for treating gravels was in Canada. In the February, 1950, issue of ROCK PRODUCTS, page 115, were published operating and cost data relating to this plant. The Canadian plant used a Wemco Mob'l-Mill plant which is the manufacturer's name for a factory-built, packaged plant.

Gravity Separation

Gravity separation of coarse materials, while not nearly as efficient as the HMS process, has been successfully accomplished by the use of the Halloway separator. This is a horizontally-mounted, conventional dredge pump shell. Centrifugal action imparted by the shell when pulp is pumped into it makes a separation. This separator was the subject of a paper presented at the 1951 National Sand and Gravel Association convention held in New Orleans, La., and is described briefly in the December, 1951, issue of ROCK PRODUCTS, page 110.

In South Africa, according to reports, an adaptation of the Hume centrifugal process for casting concrete pipe has been used to separate light aggregates from heavy. In the Hume process a steel shell is placed in a horizontal position and spun at high speeds. Concrete is fed into the center of the unit, and, due to centrifugal action, is compacted against the side of the shell with great force. It was noticed that, for example, if a piece of pumice were in the concrete it

would not compact but would remain on the interior surface of the casting as an identity. This led to experimental work wherein sized aggregates were spun in such a unit and the top fraction skimmed off to effect a separation.

Where the offending materials are considerably lighter than the coarse aggregates they can often be removed by low pressure air. The builders of a large dam in the West prepare four sizes of coarse aggregates and stockpile them, using conventional stone ladders. Near the top of each stone ladder a fan has been mounted so that low pressure air hits the cascading stream of sized gravel and blows the lighter material to a by-pass chute.

When a separation is to be effected with coarse materials one should not forget the jig, an old and time-tried metallurgical tool which, because of its simplicity, might be overlooked. We refer the reader to such textbooks as Taggert's "Ore Dressing," which is in most libraries, for details of this piece of equipment and its use.

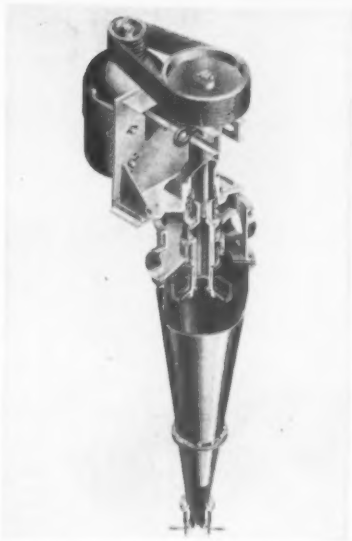
For the gravimetric separation of finer materials (sands) several newer devices are now available, some of which are 1951 developments.

In the rock products industries gravimetric separation of objectionable materials has not come up often. Coal is the most consistent offender, but in the West many plants recover variable amounts of gold. According to reports, uranium minerals may be contained in sands, and in the phosphate fields of Florida these fissionable raw materials are now being recovered.

Disregarding for the moment the recovery of any valuable by-products in commercial sand, the separation of sand-slimes has resulted in several new developments. The use of DorrClones for separation of slimes from sand was described in considerable detail in the March, 1951, issue of ROCK PRODUCTS, page 74. In this article, the operation was in the phosphate field but the general technique applies to any sand operation.

The DorrClone is a development that stemmed from the D.S.M. (Dutch State Mines) cyclone separatory process. In the latter, heavy media, similar to that used in the previously discussed HMS process, is used to separate fine sands under pressure, with the separation depending on differences in specific gravity of the solids. The system requires the pulp to be pumped tangentially into a relatively small cyclonic separator that looks similar to a conventional dust collector. Sand producers who have coal to contend with could investigate this process. American Cyanamid Co. is the sole licensee for the D.S.M. process.

For sand-slime separation, the DorrClones operate on somewhat the same principle except that water is the carrying vehicle and separation due to size is accomplished. The Dorr Co. is the sole licensee for sand-slime separations. The device is quite compact, easy to operate and install, and will handle large volumes of pulp although the units are relatively small. For dewatering tailings or for recovering added minus 100- and minus 200-mesh sands, these devices are proving to be satisfactory. Cottrell Engineering Co., Los Angeles, Calif., installed a similar type unit in a sand and gravel plant in California. Its use and operating performance were covered in the August, 1950, issue of ROCK PRODUCTS, page 108.



Another new development is the Centriclone classifier, which is a combination of the conventional cyclone and centrifuge. Sharp classifications of very thick pulp are said to be possible with its use

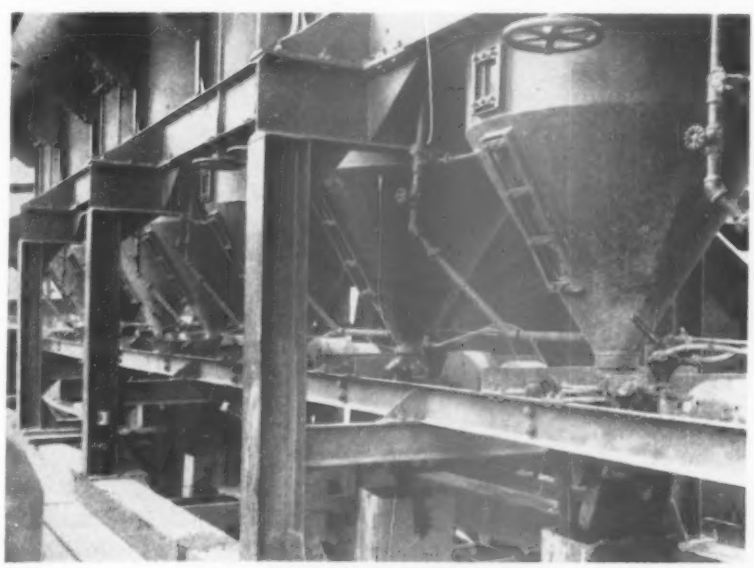
A modification of the same type cone is being developed by Equipment Engineers, San Francisco, Calif. The device has been named "Centriclone." Incorporated in the design is a mechanical feeder that receives the incoming pulp and by means of a revolving spider gives the pulp additional centrifugal motion. This cone was the subject of a paper at the 1951 American Mining Congress meeting held in Los Angeles.

The Centriclone is said to make sharp classifications of thick pulps in the 65- to 200-mesh range. Overflow particles can be held to 5 microns and underflow solids can be thickened to as high as 98 percent solids. Thirty installations are reported in use to date; these are in the 10-, 20-, and 30-in. sizes. The only one in a rock products operation is reported to have been shipped to a cement plant for use in its raw grinding circuit.

Another western manufacturer is expected to develop a fourth pressure cone of the same general type but with refinements that are intended to greatly broaden the use of classifiers of this kind.

In all of these pressure cyclones the discharge mechanism for continuously and automatically discharging the sand product is an important part of the mechanism. It does not appear to be so important if the cyclone operates under no static pressures, but where the cone operates under both dynamic and static pressures the discharge mechanism should be studied carefully.

The concentrating tables, such as



The first device of its kind to go into a rock products plant, this rising-current hydraulic classifier was installed at a sand and gravel operation in Minnesota

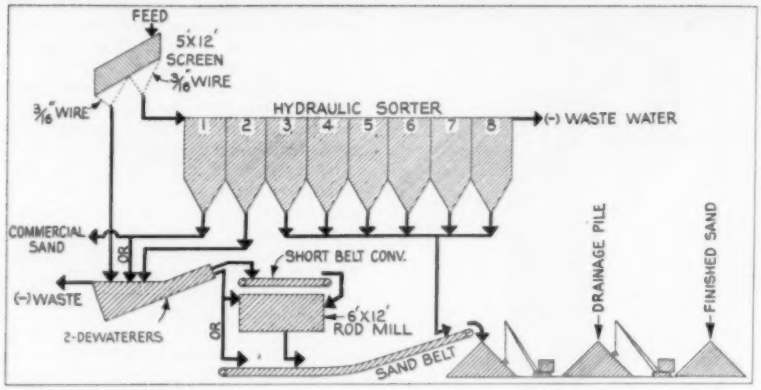


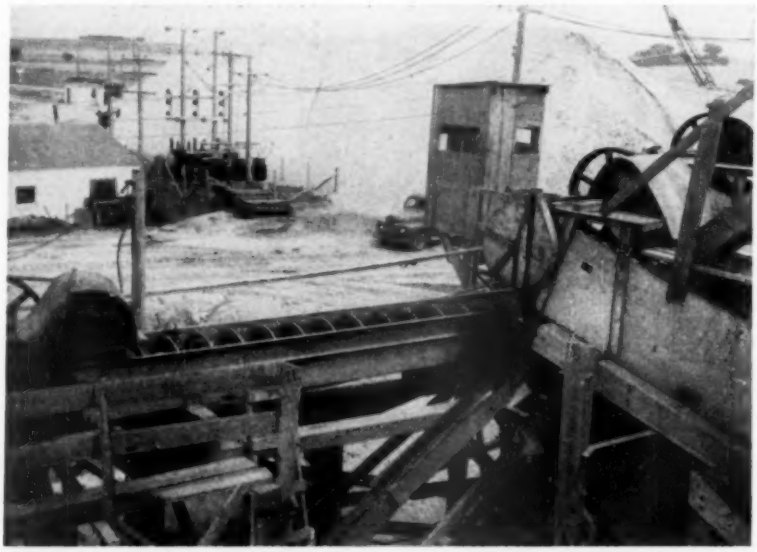
Fig. 1: Flowsheet showing method of blending sand with the use of a new type hydraulic classifier

the Wilfley and Deister machines, are quite adaptable for gravimetric separation of sands, especially in the minus ⅛-in. range. Their capacities are relatively low. A newer concentrating device is the Humphrey spiral. These have been described in connection with sand dredging operations in Florida (ROCK PRODUCTS, February, 1949, page 102, and December, 1951, page 92). The Humphrey spiral occupies little floor space and has no moving parts.

The froth flotation process has not yet found application in concrete sand production, but interest in its use in the beneficiation of silica sand for glass manufacturing is becoming more widespread each year, and several flotation plants have been installed.

Due to the development, mainly by American Cyanamid Co., of reagents that will float iron oxide (and other "heavies") from silica sand, the technique gives promise of some new trends. One silica sand operator who floats his "heavies" is considering recovering radioactive minerals from this by-product.

The flotation process is eminently adaptable to removing lignite or any harder coal fines from sand. It is the belief of many technicians that any two materials (minus 20 mesh or finer) can theoretically be separated from each other regardless of what they are, provided the individual particles are separate in the matrix or may be separated first by milling. The only requirement is a difference in surface characteristics. These characteristics can differ to infinitely small degrees and still give a separation. Limestone is being separated from silica; magnesite from dolomitic gangues; and one classic example is the reported separation of thistle seeds from alfalfa seeds. With this brief outline it should follow that opalite could be separated from fine sand by froth flotation techniques.



A specially constructed, heavy-duty screw conveyor was the key to a continuous method of blending sand in this plant. Ports in the bottom of the housing feed controllable amounts to a rod mill. The rod mill's discharge and other sand from this screw were blended on a belt to meet gradation specifications

Sand Sizing

For size separation of sand there are several new developments. At one industrial silica sand plant, specially designed "wind boxes" are used to make the several sizes. The previously dried sand is allowed to fall into a stream of air in such a fashion to bring about the desired separation (ROCK PRODUCTS, September, 1951, page 75).

In California there are several installations of horizontally running, circular vibrating (and oscillating) screens (ROCK PRODUCTS, July, 1951, page 69).

A second somewhat revolutionary type of screen was described in the October, 1950, issue of ROCK PRODUCTS, page 98, and in the September, 1950, issue, page 82, in connection with a crude perlite and pumice screening plant. These screens have the cloth mounted on a vertical gyrating and revolving screen. The feed is at the top and inside with oversize dropping out the low (drive) end. They occupy little floor space, have high capacities and are quickly installed. They are being made jointly by Symons Bros. Co. of North Hollywood, Calif., and Nordberg Manufacturing Co. of Milwaukee, Wis.

For wet processing of sand, Deister Concentrator Co. placed its Super-Sorter in a plant in Minnesota. This is the first installation of the Super-Sorter in any sand plant in the world and was described along with operating results in the November, 1951, issue of ROCK PRODUCTS, page 78.

This device consists essentially of a single row of hopper-bottomed compartments. The feed enters one end and slime rejects flow out the other end. Sand settles in the eight compartments, the coarser sizes at the feed end. The sand pockets are discharged by an ingenious mechanism under controlled conditions. By its use eight sizes of sand can be made automatically and continuously in a single machine. At the operation referred to the eight sizes were recombined as shown in Fig. 1.

Compartmented sand sizers made by The Dorr Co. were put into use at a large dam in the West. Here the eight sizes of sand were recombined by switching pieces of rubber hose (on the sand sizer's outlets) to dewatering devices as specifications required. We have seen many of these sand sizers, especially in the Far West, and one installation in a Portland, Ore., plant was the basis of a paper delivered at the New Orleans National Sand and Gravel Association meeting in 1951.

Blending of presized sand, especially to meet the rigid specifications of the U.S. Army Corps of Engineers,

has resulted in several new innovations. One of these was described in the October, 1951, issue of ROCK PRODUCTS, page 180. It revolved about the use of three Auto-Vortex Wood classifiers. The Wood classifiers resemble a small, shallow thickener, mounted to function like a pan scale. The units are provided with slowly moving rabble arms. When the weight of sand in the device reaches a pre-determined amount a gate in the bottom automatically opens and brings the unit back to equilibrium. In the installation described three units were in service preparing sand for the Corps of Engineers, and some 1500 cars had been shipped without rejections.

Blending of sand into several sizes, after previous separation, is being practiced in several installations, usually revolving about the use of two to four dewatering spirals blending previously sized sand to a blending belt. Various types of vibrating feeders make the actual delivery from the spirals to the belt and these have proved satisfactory except for the finer size, i.e., in the minus 100-mesh range. In one installation feeders were discarded because they were not of sufficient capacity to handle the desired tonnage.

The problem of the lack of minus 100-mesh and 200-mesh material in the finished product in several instances has resulted in bringing in fine sand ("aeolian sand," in one case) and blending it dry to the blending belt.

It is our opinion that the virgin sand in the pit contained enough fines to do the job but that these were lost in processing due to inadequate equipment.

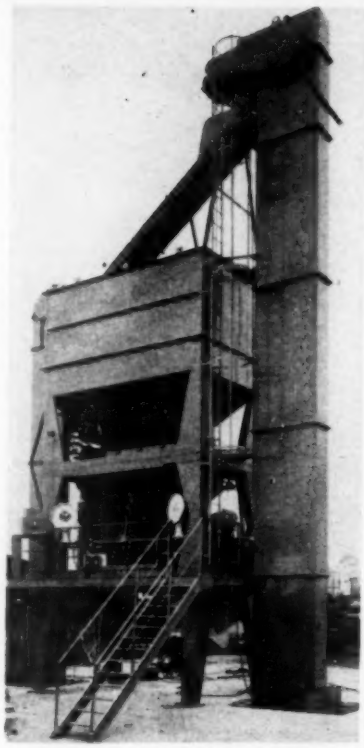
Some skillful operators are able to make a blended sand continuously with conventional equipment, but such a plant requires almost constant attention (ROCK PRODUCTS, October, 1951, page 100, and October, 1949, page 88). Both plants described were producing specification sand continuously with conventional screening, classifying, and grinding units. In the former case rod mills were used, and in the latter a Hardinge ball mill.

A new type of dump wagon went into service in a plant in the West. The body of the truck is moved backward and, in doing so, scrapes off the material and dumps it in a pile; the wagon can also be used for spreading

When contaminating materials are lighter than the aggregates, they could often be removed by low pressure air. In this installation, a fan mounted near the top of the stone ladders blows roots, wood chips, etc. out of the cascading aggregates

In several instances, hammermills operated without grids have been used successfully to eliminate flats and slivers

In efforts to get more minus 100-mesh and finer sands into their finished products several producers installed rod mills and were grinding excess concrete sand to achieve the desired fines. In our opinion, based on personal use of rod and ball mills plus observations in the field, the rod mill is an excellent "preliminator"; for grinding 2-in. gravel to minus ¼ in. it will produce a sand in the 30-, 40-, and 50-mesh ranges but is quite inept at producing a minus 100-mesh material. To grind a sand that is already minus ¼ in. to get 100-mesh products the ball mill would appear to be a far more efficient machine. The reason goes back to the theory that "the greater the number of impacts per unit of time the more the grinding," so that a ball mill loaded with small balls (yet large enough to shatter a ¼-in. particle) will have more impacts per minute than large grinding media. Obviously, a rod mill does not have a great number of grinding units volume for volume, as would a ball mill with optimum sized balls. However, when one installs a rod or



Need for profitable disposal of the finer sizes of crushed stone has led to some producers installing "black-top" plants. One of the newer processes revolves about a method based on a cold mix

ball mill, considerable study should be given to the problem before expenditures are made.

Miscellaneous Operations

The water content of sand has been a subject of debate, and from time to time we hear of some new electronic gadget that will continuously and automatically indicate the water content of sand going to a batcher. These ideas are invariably overlooked, ignored, or abandoned. The preceding also could apply in a measure to devices installed for cooling of sand.

The Conveyor Co. of Los Angeles has manufactured a machine which might be the answer to a more constant water content and, at the same time, cool the sand immediately ahead of the batcher. This involves the inundation of the sand with floods of ice water, which is the cooling step. Next, the sand is filtered on a rotary sand wheel which resembles a conventional rotary sand wheel except that the bottom of each compartment has a slowly revolving brush that acts as the filter medium. Vacuum pumps draw down the water content of the sand, in most cases to a fairly uniform percentage (ROCK PRODUCTS, June, 1950, page 102).

The use of the spiral sand classifier and dewatering machines is becoming more widespread and several rather novel uses were observed. In one case, three 78-in. diameter Wemco spirals were installed near the pit and excess sand and slimes were wasted there instead of transporting them by a long belt conveyor to the plant, and there wasting them. In another plant four spirals, each 28 ft. long, were in use as sand recovery machines. The long length was designed to dewater the sand more adequately before stockpiling.

An ingenious method of preventing segregation of sand in a large pile was observed wherein two parallel sand reclaiming tunnels were used. Each tunnel had its own belt and these unloaded to a common offbearing belt. By use of "pant-leg" spouts to build up the stockpile, and two reclaiming tunnels, segregation was reduced considerably.

Several operators changed their pit-to-plant transportation to long belt conveyors, which have been popular in the Far West. One operator in Iowa uses a suction dredge to pump to a shore preliminary plant, with final conveying to the established finishing plant located inshore a considerable distance.

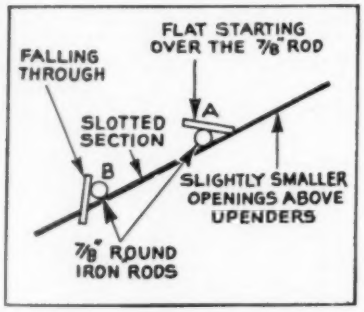


Diagram showing operation of an "up-ender," a device used by one producer to screen and segregate flats and slivers

The use of dredges of both the ladder and suction pump types, which appears to be based on the type of deposit, has found favor where large tonnages have to be handled and transported over great distances. Some of the older suction dredge operators continue to use the old practice of first pumping the material for about 800 ft., dumping it back to the pond, then picking it up again and pumping to the plant. The second pumping is designed to help break up clay balls, and to solve transportation. An interesting suction dredge installation was described in ROCK PRODUCTS, September, 1951, page 92, and in the December, 1951, issue, page 92, was described a 20-in. Emsco dredge used in Florida.

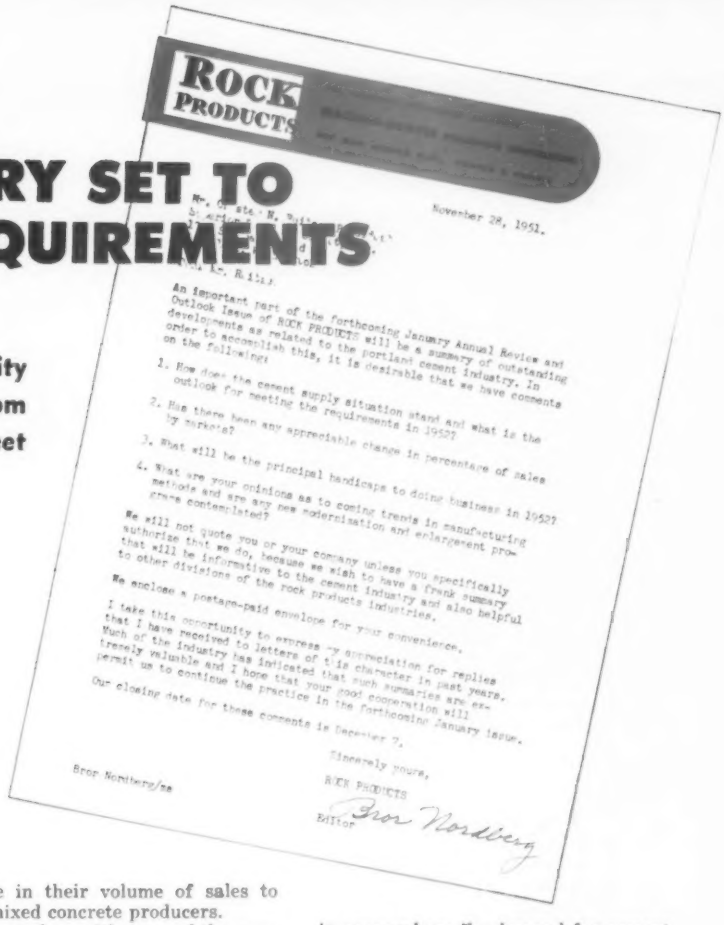
In Colorado, a "doodle-bug" dredge has been placed in service at a sand and gravel operation. This dredge has a dragline on crawlers which feeds to a processing plant built on pontoons. These units were originally designed as placer gold recovery units. The Colorado installation near Denver is doing double duty, recovering gold and processing sand and gravel for commercial aggregates.

Sensing the need for more information relating to tailing control, ROCK PRODUCTS, in the December, 1951, issue, published the eighth article on this subject. Articles published on this subject appeared in the following issues: (1) December, 1949, page 99, methods for building tailing ponds; (2) July, 1950, page 72, methods of impounding tailings; (3) September, 1950, page 93, methods used by Bagdad Copper Co., Bagdad, Ariz.; (4) February, 1951, page 112, methods used by Inspiration Copper Co., Inspiration, Ariz.; (5) June, 1951, page 124, methods used by Magma Copper

(Continued on page 180)

The development of a two-level underground quarry in the West introduced some novel pieces of equipment. These include a mobile blasting platform (left) used for loading high breast and back holes, and a telescopic rig (right) for scaling platforms

CEMENT INDUSTRY SET TO MEET 1952 REQUIREMENTS


ROCK PRODUCTS

November 28, 1951.

An important part of the forthcoming January Annual Review and Outlook issue of ROCK PRODUCTS will be a summary of outstanding developments as related to the portland cement industry. In order to accomplish this, it is desirable that we have comments on the following:

1. How does the cement supply situation stand and what is the outlook for meeting the requirements in 1952?
2. Has there been any appreciable change in percentage of sales by markets?
3. What will be the principal handicaps to doing business in 1952?
4. What are your opinions as to coming trends in manufacturing methods and are any new modernization and enlargement programs contemplated?

We will not quote you or your company unless you specifically authorize that we do, because we wish to have a frank summary that will be informative to the cement industry and also helpful to other divisions of the rock products industries.

We enclose a postage-paid envelope for your convenience.

I take this opportunity to express my appreciation for replies that I have received to letters of this character in past years. Much of the industry has indicated that such summaries are extremely valuable and I hope that your good cooperation will permit us to continue the practice in the forthcoming January issue.

Our closing date for these comments is December 7.

Sincerely yours,

ROCK PRODUCTS

Bror Nordberg

Editor

Bror Nordberg/ns

Decentralization of plant, new capacity and more continuous production from existing mills should combine to meet any normal demands

By BROR NORDBERG

PORTLAND CEMENT MANUFACTURERS ended the year 1951 with shipments approximating 240,000,000 bbl. of cement, to establish a new all-time record, and the industry is well prepared to meet heavy 1952 demands. Potential clinker producing capacity has been increased to about 275,000,000 bbl. This represents a 20,000,000 bbl. increase in potential capacity.

These figures are based on a summary of letters received from the presidents and other top officials of cement companies. This year, our letter had requested specific comments on the cement supply situation and the prospects for meeting 1952 requirments; comment on the principal handicaps anticipated to doing business in 1952; modernization and expansion plans. It was gratifying that responses were received from companies representing more than 60 percent of the national capacity.

Apparently, there was sufficient supply of cement over-all in 1951 to take care of the demand, and shortages were spotty and of comparatively short duration due chiefly to unusual circumstances. The early fall months were most troublesome in affected areas due to a combination of sudden and abnormal demands because of unusual construction activity and because of poor scheduling on the part of purchasers. Surpluses and shortages had occurred periodically in affected areas. Unusual demands because of the military program had their adverse effects and one difficulty has been that such projects have taken normal sources of supply from regular customers, forcing them to purchase out-of-area cement at penalties in cost.

Predictions that 1952 demands will be met adequately are borne out by letters received from ready-mixed concrete and concrete masonry producers which are summarized elsewhere in this issue. Comparatively few indicated that cement supply now is a serious handicap to their operations. Yet, cement manufacturers report a decided increase in their volume of sales to ready-mixed concrete producers.

We quote herewith some of the comments received from cement manufacturers, on the question of supply and market distribution.

One of the largest manufacturers with multiple plants in many areas believes the question of cement shortages is being successfully met, as expressed in the following:

"In ten months of 1951 the cement industry shipped over 211,000,000 bbl. This indicates that shipments for the entire year will approximate 240,000,000 bbl. which will break the all-time record set in 1950.

"There was an over-all supply of cement to take care of the demand this year. It is true that cement was hard to obtain in certain areas at certain times. This was so because in most of the country cement is wanted particularly during the seven months' period from April 1 to November 1. The months of September and October, when cement stocks have been generally exhausted, constitute the most critical period. In other words, everyone then wants cement at the same time, whereas, if the demand could be spread over a 12 months' period, shortages would either disappear or be much less apparent.

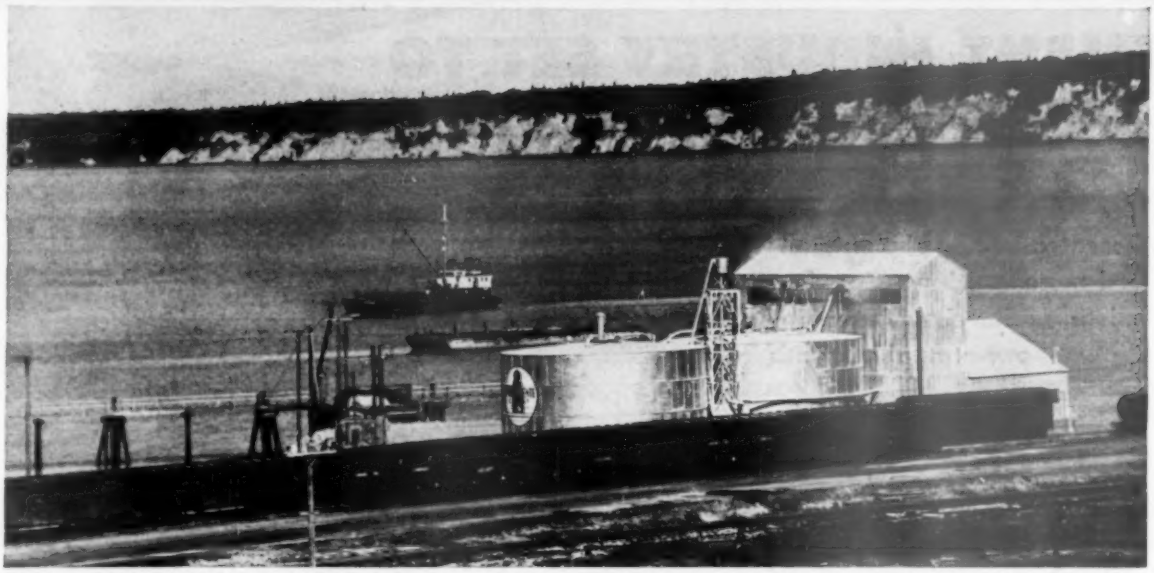
"Another reason for shortages in some areas is because of abnormal demand for cement in those areas due to unusual construction activity. In such cases our company shipped into distressed areas from plants located in areas where the demand for cement was not as great.

"To sum up, the demand for cement, as has been the case in recent years, was not equally distributed throughout the territory which we serve and we found ourselves confronted by both deficiency areas and surplus areas.

"It is our belief that the demand in 1952 will be less than in 1951. F. W. Dodge is estimating a reduction in total physical volume of construction of 15 percent. We do not believe cement demand will depreciate to this extent. We expect a reduction of not more than 10 percent from 1951 shipments which could result in industry shipments next year of 216,000,000 bbl. which would be still larger than those in any previous year except 1950 and 1951. In other words, once again we do not expect an over-all shortage of cement but the matter of distribution will again be a problem, at least in certain localities because we expect the demand to be spotty again next year."

One of the larger Midwestern concerns with several mills had this to say:

"We are now making a detailed survey of the market to gauge the prospects for 1952 but we do not have conclusions to report at this date. All we can say, therefore, is that 1952 prospects look fairly good, particularly in the areas we serve. This, however, is based on some expectancy of



Bulk transportation of cement by water has been playing a greater part in cutting costs for the industry and is expected to continue in importance. Permanente Cement Co., at its Anchorage, Alaska, bulk distribution plant, is one of such installations being used to facilitate cement deliveries

increased steel production with consequent better availability of steel for construction projects. It is also based on no worsening of the international situation.

"On the matter of matching supply and demand, we think the industry did pretty well in 1951 when it is taken into account that some sudden and unusual demands arose in some areas in connection with the rearmament program. This required movements into such areas from more distant plants but it is our impression that such demands, on top of the normal civilian demands, were pretty well taken care of in this manner. Of course the current method of pricing by many cement companies, which was induced by Supreme Court pronouncements in the field of economics, did bring about some high delivered costs for cement in these areas. Not only that, but it also resulted in an unbalance in some cases in the relative amounts of the high cost cement that went for private business on the one hand and rearmament on the other. In other words, where the government scalped off most of the cement supply normal to the area, private purchasers had to get most of their requirements from more distant plants at much higher delivered costs. This would not have been the case if the Federal Trade Commission and the Supreme Court had not gone down the line in favor of the theory of uniform one-price plant pricing. This demonstrates what harm can come from pursuing a theory in the realm of practical, down-to-earth economics.

"Basic cement clinker production of the industry for 1951 will be nearly 30,000,000 bbl. greater than for 1950. This is an increase of more than 10 percent over 1950.

"We feel that the cement industry will adequately meet the demand in 1952. We figure that the cement clinker production potential will be close to 275,000,000 bbl. for 1952. This is 20,000,000 more than for 1951.

"There were major shifts in 1951 in classes of work using cement. House building took much less cement and that was also true of commercial, religious and institutional building. But more than offsetting these reductions were substantial increases in highway building, industrial expansion and military installations. Thus, portland cement use did shift during 1951 from small uses to larger work and, in this connection, it is evident to us that ready-mixed concrete was used more extensively than in the prior year."

A Midwestern manufacturer with several mills:

"The cement supply in 1952 should equal the demand in our areas.

"There has been a decided change in markets due to the wide development of ready-mixed concrete plants in cities of 10,000 population or more. The establishment of such plants has resulted in material reductions of sales in markets served by the smaller dealers with resulting increase in sales to markets where ready-mixed concrete plants are located."

Another Midwestern manufacturer shipping widely through strategically located distributing plants:

"I believe it is generally known that in the area which we serve, there was a rather critical shortage of cement during the months of September and October. We have rumors of cement coming into the Detroit area from great distances. In periods of sudden and acute shortage, such as we experienced this fall, we never know just how many barrels of cement are involved. Sometimes, even a relatively small amount would relieve the situation. We do know that the period of stress was of short duration and we are of the opinion that the production in this area in 1952 will be able to satisfy the demand throughout the entire year.

"We have not noted any appreciable change in percentage of sales by markets. Our own distribution holds about the same both as to types of markets and type of container, that is to say package or bulk."

A California manufacturer:

"We anticipate a considerable improvement in the cement supply situation for northern California during 1952. We believe this to be the case despite the fact that our present inventories of cement and clinker are virtually at the vanishing point. The principal reason for this optimistic outlook is the increased productive capacity which will be effective in this area during 1952.

"Our company is now in the midst of its second major postwar expansion program. Earlier in the year we completed erection of four new finished cement silos, boosting our cement storage capacity by 60,000 bbl. We have recently installed, or will install during the next six months, a fourth kiln, a new Cottrell electric precipitator, a new stack, three new grinding mills, an electric shovel, a Joy drill, and four blending silos. By the middle of 1952 our cement producing capacity will be three times capacity of five years ago.

"Because of the heavy demand for cement for government projects and private construction, there have been

times during 1951 when we were unable to satisfy all the requirements of our regular customers. This situation, however, should be corrected in 1952 by the increased output of our plant. In fact, it is possible that the sharp decline in commercial and residential construction (caused by recent federal building restrictions) might even create an oversupply of cement in this area.

"During 1951 we have delivered an unusually high proportion of our output to military bases and to other vital government projects. In the year ahead we will probably ship at least an equal quantity to these sources; with our increased capacity we should also be able to deliver larger quantities of cement to ready-mixed concrete plants, lumber yards, and other retail dealers."

An Eastern manufacturer, also shipping in the Southeast region:

"The demand for cement in our so-called home markets has exceeded our stock and production thus far this year. It is our belief, however, that the demand in these areas has been more nearly met than it was in 1950. In some cases, we believe this is due to freedom from labor troubles this year plus improvements in efficiency. In other cases, there has been a substantial increase in plant capacities.

"It is our belief that cement capacity in the Middle Atlantic states and in New England will be sufficient to meet any demand that we foresee for 1952. It is our opinion, however, that the demand will nevertheless remain high. In the southeastern section of the United States, we believe the overall demand for cement in 1952 may well exceed the available cement capacity despite further substantial increases in that capacity which will come into being next year.

"Our company hopes to have in production early next year a new kiln in South Carolina with an estimated annual capacity of one million barrels. The southeastern section of the United States is expanding rapidly industrially, and construction demand will continue high in that area in 1952, as we see it, on top of a huge demand for cement in South Carolina by the Atomic Energy Commission.

"As far as we are concerned, the most appreciable change in percentage of sales by markets has been an increased demand from the ready-mixed concrete producer. It is likewise worthy of note that the demand for cement in bulk continues to increase."

A Michigan manufacturer:

"This year we were able to do a very good job serving our customers. Late in the season our shipments were delayed some due to the heavy demand and depleted inventories at our plants but the actual pinch was not of long duration.

"At the present time we are in a position to completely meet the demand in our marketing area. We believe also that we will be able to do as well in 1952 as we did this year and perhaps better, even though indications point to another lively market.

"While there have been no appreciable market changes this past year, ready-mixed concrete plants have made the greatest increases in cement purchases."

Pacific Northwest:

"There is an ample cement supply in the Pacific Northwest and there will be plenty for 1952.

"We have experienced a rapid decline in shipments to private construction, which has been more than offset by the large defense program in the Pacific Northwest."

A single-mill Eastern concern:

"At the present time, taking into account the increased production that will come into being during the 1952 season in our area, the outlook for meeting the cement requirements very definitely is better than at any time during the past five years.

"Our percentage of sales in the metropolitan markets has shown a definite increase, due to war expansion in industry and also the concentration of new housing and facilities in defense plant areas.

"Distribution has been, and still is, suffering from a need of clarification by proper government authorities on the legality of freight absorption to meet competition.

"Consumption this year has been approximately 37 percent greater in Oregon than it was in 1950. This is due entirely to cement supplied on dam construction. It is estimated that commercial business has been slightly less this year than last."

A Western manufacturer with several plants:

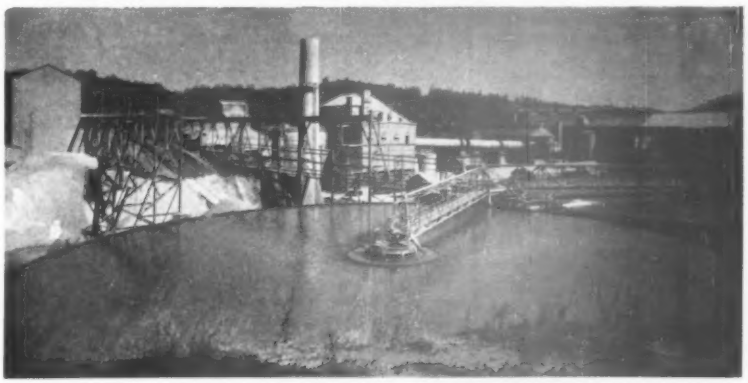
"At present the demand for cement in the areas which we serve is somewhat spotty due to the tapering off of private construction. The outlook for cement demand in 1952 at this writing is such that we are confident that we can meet all requirements in those areas which we are trying to serve.

"There has been an appreciable change in percentage of sales by markets, and we expect a more marked change within the next six months. Private construction is pretty well slowed down, and while the military program has not yet picked up to the point of making up for the private construction losses, it looks as though it should do so by the first of July, at least in those areas where substantial military or defense construction is to be done."

A California cement manufacturer:

"As far as northern California is concerned, we believe the cement requirements for 1952 will be met completely.

"There has been an appreciable change in the percentage of sales in the northern California market this past year. This is due to the military work, and also the various dam projects that are now under construction, namely Friant dam, and in 1952, Folsom dam will have a substantial effect on the sales of northern California."



Calaveras Cement Co., San Andreas, Calif., has greatly increased capacity. Shown here are two 150-ft. thickeners

"We have just completed an expansion in our production, which will give us an additional 600,000 to 700,000 bbl. of portland and mortar cements, which will materially augment the cement supply in our area."

Pacific Northwest:

"Two California cement companies have been shipping cement into Oregon on dam construction jobs. Aside from this, the local companies are taking care of the available business in this state. It is believed that local cement companies will be in position to supply all business which will be here in 1952.

Canadian manufacturers commented:

"The cement situation in the Province of British Columbia, Canada, was vastly improved for the year 1951, when the B. C. Cement Co. Ltd. looked after the total requirements and none was imported from the United States or foreign countries. The same situa-

tion will in all probability prevail during the year 1952."

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"During 1951 there was a shortage of cement in Canada due to the heavy demand for defense construction work. With present expansion plans of the cement industry in Canada, this shortage will be overcome in 1952. The Canada Cement Co. has completed a new plant at Havelock, New Brunswick, and we are increasing the capacity of our Belleville, Ontario, and Exshaw, Alberta, plants.

"The only appreciable change in percentage of sales by markets is the increased demand for defense purposes."

Shown above is the Detroit retail plant of Huron Portland Cement Co., one of a number served by cement carriers from the Alpena mill

Handicaps

Among the handicaps to business anticipated for 1952, the most frequently mentioned were the availability of structural and reinforcing steel, government restrictions adversely affecting construction, and expected shortages of repair parts and supplies. One manufacturer mentioned a possibility of shortages of grinding media.

Typical of the comments were the following, in part:

"In our opinion the principal handicaps to doing business in 1952 will be caused by shortages of critical materials needed in construction."

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"If the government would permit business to run business, handicaps would be greatly minimized. The darkest spot we have on our distribution horizon is allocation of steel for highways and building construction as the allocation system is operating at present, or the complete lack of it in the event international situations arise."

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"We do not anticipate any handicaps to business other than we experienced in 1951. There is a constant problem of getting delivery on steel, machine parts, etc. This handicaps both the cement producer and consumer but we do not anticipate any greater trouble next year than we have had in this respect for the last 12 months."

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"The only principal handicap of doing business in 1952 that we can think of is the ability to obtain scarce materials, such as steel, copper, and aluminum, in event plant expansion is to be accomplished this year in the cement industry. Unless higher priorities are established for the cement industry, as far as plant expansion is concerned, we believe that said expansion will be considerably slowed down."

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"The principal handicaps to doing business in 1952 will, of course, be government controls, among them the restrictions, for construction purposes, of the use of controlled materials, principally steel, and the credit restrictions on home building. However, if it is true that the supply of steel used in concrete reinforcing is not as short as government figures indicate, it is to be hoped that a modification of the Controlled Materials Plan may be forthcoming before too long thus making more steel available for highways, bridges and other construction which is not strictly defense work."

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"The principal handicaps for next year are governmental regulations, plus an increase in difficulty in securing quick delivery of repair parts and supplies needed in emergencies."

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"At this time it seems to us the principal handicap with reference to doing business in 1952 is going to be the results of the tight controls that are gradually being enforced with regard to construction. In addition to this will be the unbalanced demand because of the heavy concentration of the military program. We expect at some of our plants that we will be very busy manufacturing enough cement to fill the military and defense requirements (although we think we can take care of anything that is now in prospect), and in other areas where the civilian program has been curtailed and there is no defense work being done, we may be hard put to it to find enough business to keep the plants running on a sound basis."

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"Not wishing to go too much into detail, it is perhaps well, however, to express the opinion that the ever-increasing trend toward socialism in our government continues to have the greatest effect on our industry. Increased taxes, controls, restrictions under the guise of the Korean situation, are steadily destroying individual initiative and gnawing away at our freedom, which is so dear to all of us and our free enterprise system."

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"There will be difficulties, of course, in securing necessary maintenance materials but these, at the moment, don't look insurmountable to us. We expect that labor will cause us some trouble during the early months of next year and that contract negotiations may be prolonged even more than was the case in 1951. However, we think that we will be able to settle with labor on a mutually satisfactory basis."

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"Our principal handicap to doing business in 1951 was the price freeze in the cement industry under the General Ceiling Price Regulation of January 26, 1951. Our production costs soared during the year while at the same time we were not allowed to make any price increases to reflect these higher costs. However, the Office of Price Stabilization General Overriding Regulation 21, which was just issued should make it possible for us to obtain relief during 1952 from this squeeze on profits. The difficulties which we anticipate during 1952 are continuing ones: (1) high taxes; and (2) the policy which has apparently been established by the Interstate Commerce Commission of granting percentage-wise increases in rail freight rates."

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"In our opinion, the principal handicaps to doing business in 1952 will be governmental regulations as to materials, prices and mortgage money. We anticipate great difficulty in obtaining spare parts for our own operation, and we believe the supply of steel, copper and aluminum will continue short in at least the first half of the year and defer vast amounts of construction both in the building field and in the heavy engineering field. It is our opinion that except for spot shortages there will be sufficient supply of box and covered hopper cars."

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"It is believed that shortages of steel and government building restrictions will reduce the volume of construction in Oregon quite materially. I would not want to hazard a guess as to the estimated percentage of decrease."

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"Probably during 1952 we can expect shortages of materials required in cement production and in concrete

construction. Increasing costs and freight rate charges will also be factors influencing sales. Apparently too there is a feeling of uncertainty among builders caused by controls, shortages, costs, etc."

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"There will be all sorts of handicaps, but we doubt if any of them will prevent a rather full production of cement."

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"The principal handicap to doing business in 1952, in our opinion, will be the shortage of steel. This, however, should ease during mid-year."

Plant Expansion

While a great amount of expansion and modernization has already been completed since World War II, much more will continue to be done in the immediate future, according to our letter replies. Apparently, the tendency to more bulk cement shipments continues and quite a few companies are installing or improving bulk-loading facilities. Other trends in manufacturing are covered in a separate article in this issue. Among the comments received by letter were the following:

A Midwestern manufacturer:

"In terms of the end product, we sense a trend away from the multiplicity of types of portland cement now represented in the A.S.T.M. and federal specifications toward only a standard and high early strength cement with, probably, their air-entraining counterparts. The 'standard' cement would be a compromise between the present Type I and II portland cements. On air-entraining cements, we continue to hold the view that putting the air-entraining agent in the cement is not the right answer to producing concrete with the proper air content, and we intend to give greater publicity to this view during 1952.

"We are contemplating much new modernization work for 1952 and beyond. In this program we will have one complete plant rebuilding job as well as numerous other projects that will be designed to reduce fuel consumption and costs otherwise. A complete revamping of the clinker grinding department at one plant is also in this program.

"No further enlargements are being considered at this time except in connection with the one complete plant rebuilding job already referred to. However, we are considering some extensions of primary distribution facilities (shipping plants in metropolitan areas and rail-river transport facilities)."

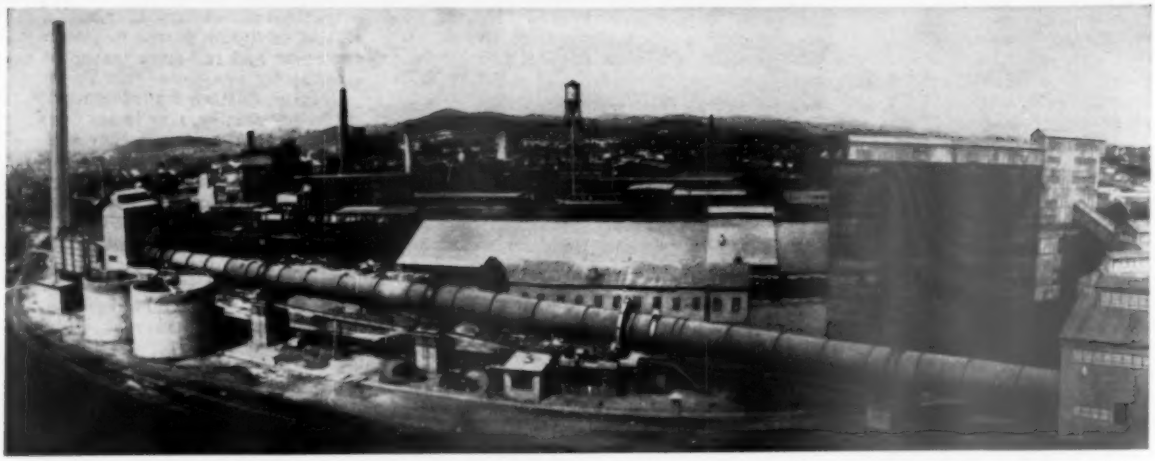
A large Eastern manufacturer:

"In our opinion, now is not the time to engage in modernization and enlargement programs on a large scale in view of the armament program and the shortage of critical materials."

Huron Portland Cement Co.:

"As far as enlargement programs are concerned, we can speak only for ourselves. We have just bought a new boat which will be brought to the Lakes sometime next year and it is our intention, as soon as the necessary construction permits can be obtained, to increase our production to the extent of 2,000,000 bbl. annually by the addition of four new kilns similar to the ones we now operate, namely 10 x 153 ft. each. It will also be necessary for us to increase our raw grind and finish grind departments with the finish grind particularly being stepped up considerably to the tune of about 10,000 bbl. a day so as to give us during the season of vessel operation a daily grind of about 35,000 bbl. We are currently involved in the purchase and installation of a new 12,500-kw. generator with new water

New St. Louis plant of Missouri Portland Cement Co. has many operating features that denote great progress



Largest rotary kiln yet installed in the Americas to conserve fuel is this 12- x 500-ft. unit in Penn-Dixie Cement Corp.'s Kingsport, Tenn., plant

intake and substantial changes in pumps, piping, wiring, etc. Also, we are undertaking the modernization of our shale quarry, with the installation of a new crushing unit and the changeover from cars to trucks in the quarry itself."

A California manufacturer:

"In distribution there seems to be a trend in the direction of making deliveries of cement by contract highway carriers. Some efforts are being made by rail carriers to meet that situation.

"We do not see any impending change in manufacturing methods. There has been considerable modernization and enlargement activity much of which is still in process. No doubt that trend will continue in 1952."

A Michigan manufacturer:

"At this time we have made no plans for modernization or enlargement of any of our plants. Instead we are anticipating our requirements of materials, following the details of production and, in general, paving the way towards the utmost in efficiency."

An Iowa manufacturer:

"As far as our company is concerned, we did not expand our manufacturing facilities during 1951 and do not contemplate any such program in 1952. We did, however, make several plant improvements, including a complete revamping of our power department, the installation of dust collectors in our plant and air separators in our raw end."

From the Rocky Mountain area:

"As to distribution, the trend is more and more to bulk delivery. And one significant development here, I think, is the fact that we are making an honest effort to improve our loading facilities to take care of the trend. We are in the process of adding a new kiln and additional raw and finish grinding equipment."

From the Pacific Coast:

"This company has an application in with the federal government for a certificate of necessity for an enlargement program."

A Southern manufacturer:

"There is a great deal of modernization and enlargement going on. In new mills and mills that are being rebuilt, there seems a trend toward the dry process. This appearance may be accidental because of the location of certain new and rebuilt units."

A small Pennsylvania company:

"As to distribution, we would say the general heavy trend, at least in this section, is to truck delivery. Up to within a year or so ago, everything in this section was by rail.

"We know of no unusual trends in manufacturing methods. As to modernization and enlargement, we are at the present time erecting an additional large bulk bin to further facilitate the loading of bulk cement to trucks.

"We also have under consideration the installing of a clinker breaker and two preliminary grinding mills which will give us considerable additional production and balance off our finishing with our raw grinding and kiln capacity."

A manufacturer in Pennsylvania:

"We have followed a continuing program of modernization and expansion of our production since the close of the second war. New installations now in progress at our plant will provide an increased production capacity for 1952 of 10 percent above 1951 capacity and 33 percent above 1946."

A Michigan manufacturer:

"Our expansion program, begun in 1950, has already been set back one year because of building restrictions. Just now in the middle of it, we are materially retarded in our progress.

"During 1951 we did complete installation of a new 11- x 400-ft. kiln at one of our plants, which has doubled that plant's output. In the latter part of the year, we initiated the transportation of clinker from that plant to Detroit, by water, for conversion to finished cement in Detroit. The trend toward bulk shipment continues to increase and it is apparent that additional facilities will have to be provided to meet this increase."

A Western manufacturer:

"Insofar as our company is concerned, we are just completing a program which in the past six years has required approximately $32,000,000 of capital spending. In our own case we do not have any further expansion plans at this time, but there will be the usual necessary modernization and maintenance requirements which, of course, will be on a scale that we would consider just normal operating practice."

From California:

"Regarding enlargement programs, we just finished the early part of this year the enlargement of our plant by about 25 percent of its former capacity; however, we also are considering additional expansion which may or may not take place, depending on our ability to obtain materials, and also the demand in the markets which we serve."

Buys Limestone Company

GEORGIA MARBLE CO., Tate, Ga., has announced the purchase by its subsidiary, Alabama Limestone Co., of the entire physical assets of Rockwood Alabama Stone Co. The acquired quarries and facilities include approximately 1700 acres of land. At the two principal quarries, a fine limestone of the hard, dense, oölitic type is produced. The plant facilities include two modernly-equipped fabricating mills and a crushing plant.

Officers of Alabama Limestone Co. are James R. Cowan, president; S. E. Hyatt, vice-president; William L. Vance, Jr., vice-president; Granger Hansell, secretary; R. C. Sibley, Jr., assistant secretary and treasurer; and Gardner W. Putney, general manager.

Elements of Efficiency In Lime Calcination

Preheated combustion air, optimum air-fuel ratios and best utilization of high level heat important to firing efficiency

By IRVING WARNER*

We asked Irving Warner to contribute an article on technical developments in the lime industry for this issue. Mr. Warner accordingly submitted two separate articles of great value to producers of lime and gave us our choice. Each article contains information and ideas of such practical significance that we publish both herewith.
THE EDITORS

THIS ARTICLE IS directed particularly to the practical operating man. Perhaps the plant engineer and manager should give it consideration. While we will deal principally with the rotary kiln, the discussion applies equally well to the shaft kiln.

There are five requirements for kiln efficiency:

1. Perfect combustion with 100 percent theoretical air;
2. Saving and use of the heat in the calcined lime;
3. Saving radiation losses, particularly those at the firing end of the kiln;
4. Keeping the temperature of the gases at a minimum at the point where calcination begins;
5. Sufficient preheating zone.

Perfect Combustion

Taking the first item, namely perfect combustion, it must be recognized that fuel requires a theoretical quantity of air for perfect combustion. For the average coal, this is 10 lb. of air per lb. of coal or about 132 cu. ft. of ordinary air. If there is insufficient air, combustion is incomplete, and a serious heat value is lost. The evidence is smoke. The part of the fuel that is only half burned gives off only about one-third of its possible heat.

If excess air is used, the full possible heat is generated but heat is uselessly employed in raising this excess air to calcining temperature.

There is "high level" heat and "low level" heat. Just as a gallon of water in an overhead tank is valuable and a gallon in the sewer is worthless, so is the high level heat valuable for calcining lime. And there is always an excess of low level heat good only for preheating the stone. Either excess or insufficient air reduces the amount of high level heat, and increases the amount of useless low level heat. Excess low level heat must go out the stack as hot gases so incorrect air raises the temperature of the stack gases.

A rotary kiln can be run with the exact 100 percent of theoretical air. To do this, the equipment must be right, and kept in good adjustment and operating condition. With 100 percent air, the stack will show a faint brown haze which must not be confused with any color that is due to dust that may be in the gases.

In hand fired shaft kilns, the problem is difficult due to intermittent firing. By regular firing at prescribed intervals, there is improvement. By pushing the coked coal forward and firing largely in the front end of the furnace there is also improvement.

Heat Utilization

The second point covers the utilization of the heat in the lime. The operator wants cool lime as a matter of convenience and looks with favor on much loss of heat in his coolers. This is a mistake. The cooling of the lime should be done by the air of combustion, and this heat restored to the kiln. In any kiln, there is more air required than lime produced, so it is theoretically possible to cool lime thoroughly without the radiation losses of a cooler.

This heat should be restored to the kiln to increase the percentage of high level heat. The dividing point in a shaft kiln may be 1500 deg. F., but in a rotary, it may be as high as 2200 deg. F. If the combustion must start at 100 deg. F., a lot of heat must be used to raise the temperature of the gases to the high level good for calcination. Air preheated to say 600 deg. F., when cooling the lime, is at an elevated starting point for raising the gases to calcination temperature, and thereby increases the quantity of high level heat.

Unfortunately, rotary kilns in general are not well equipped for this air preheating, lime cooling work. But the operating man can help by making all the air possible go through lime chutes, hood, etc., in a way that will do some work of preheating. Also, when an engineer is trying to work out the difficult problem of installing an air preheating cooler, the operating man must give full help and cooperation to the desired end. He must realize that an important improvement will result, not only in efficiency but in having cooler lime. He can help because of his practical experience.

In a shaft kiln, a deep cooler permits the entrance of more air. Unfortunately coolers are much too small. Recently constructed shaft kilns with gas or oil firing are usually designed for the secondary air to go through the coolers. Operating men then have trouble with local hot spots and find the kiln is easier to control if the coolers are closed, and the air admitted largely with the fuel. Rather than do the easy job of closing off the coolers, the operator should find means of using this hot air properly.

To sum up, the only correct way to cool lime is by the air of combustion, and there is always enough air to cool the lime properly. Surface radiation of the cooler is not necessary and such heat loss results in lower efficiency.

Radiation Losses

The third point is to save radiation losses. Little can be done in the main part of a rotary kiln. Insulating the preheating end, above the point where calcination begins, is of little or no value. But if the management attempts to use insulation for a portion of the kiln, practical experience may help solve the problem.

There is a phase of this work where improvement can be effected by joint action of management, engineer and operator, and that is the heat loss at the firing end of a kiln, either shaft or rotary. All heat loss from hoods, furnace fronts or any other point at the lower end is a loss of high level heat. This includes the radiation losses of any coolers. All this loss causes a lowering of the temperature where the combustion must start, and makes that much more work for the fuel to get up to high level heat. In rotaries particularly, the hood should be well insulated with a minimum of castings that brings the heat out to the front. It may be stated as a maxim that any unpleasant heat at the firing end of a kiln is an expensive heat loss

*Vice-president, Warner Co., Philadelphia, Penn.

	HEAT REQUIRED BY CHARGE			HEAT IN COAL		
				DIVIDING TEMPERATURE		
	A	B		1800 DEG.	2000 DEG.	2200 DEG.
PREHEAT TO 1500 DEG.F. LOW LEVEL	704 33 PERCENT	704 29 PERCENT	LOW LEVEL	39 PERCENT	43.5 PERCENT	48 PERCENT
TO CALCINE HIGH LEVEL	1378 67 PERCENT / 2082	1762 71 PERCENT / 2430	HIGH LEVEL	61 PERCENT	56.5 PERCENT	52 PERCENT

Table I. High level versus low level heat; base temperature = 100 deg. F.; figures in B.t.u.'s per lb. of lime. Column A is the theoretical heat requirement. Column B shows the heat required in the calcining zone, including raising the temperature of the solids and the evolved CO_2 to some practical temperature above 1650 deg. F.

to the owner. So comfort and efficiency go hand in hand.

Gas Temperatures

On the fourth point of low temperature gases at the point where calcination begins, the shaft kiln is excellent. The close contact between gases and stone causes the gas temperature to be little higher than the stone itself which is at 1500 deg. F. In the rotary, the corresponding gas temperature may be anywhere from 1800 to 2200 deg. F. The gas temperature at this point is the dividing line between high and low level heat. High temperature gas at this point means less valuable high level heat, and more of the excessive and useless low level heat.

In the chart showing the temperatures of gases and charge in a rotary (Fig. 1), it is to be noted that there is a minimum temperature difference at the point where calcination begins. This is true of any kiln. This causes a zone of poor heat transfer above and below the point of initial calcination. This is the "critical zone" of a rotary kiln.

Table I shows the increase in percent of the valuable high level heat by reducing this gas temperature.

Refractory cross tile can be inserted in this section of the kiln, and should be placed about two-thirds above the point of incipient calcination and one-third below. They are costly to install and maintain. But the operating man must realize that they effect a fuel saving and output gain, so he can contribute his experience in their installation and use.

Correct combustion has an important effect on the temperature of gases at this point, and in this, the operator can do a good job. In a rotary kiln, we have a difficult combustion problem. Near the discharge end of the kiln, the lime can absorb heat only very slowly because it is approaching complete calcination. The flame temperature must not be too high. Hence the fuel must develop its heat slowly at first.

However, the combustion and generation of heat must be substantially completed well before the gases reach the point of initial calcination. Then their temperature will drop rapidly to give a minimum gas temperature where calcination begins.

Insufficient air will cause combustion and heat generation to continue right up to this point. Too often, combustion will continue throughout the preheating zone and even cause secondary combustion in the dust chamber or stack base when additional air leaks in through the sealing ring. Thereupon valuable high level heat is wasted or used for the low level job of preheating.

It is necessary to get the combustion air into the kiln in a manner to avoid flame turbulence so heat generation is slow at first. But the air must be uniformly distributed around the fuel so that complete intermingling takes place rapidly and thoroughly further up the kiln so that the combustion can be completed well before arriving at the point of initial calcination.

This is often a difficult job. It is handled properly in some types of installation. But in the average installation, air is only too likely to be localized on one side, top or bottom, of the fuel pipe. Most rotary kilns have a simple hood with various openings to admit air. Some air comes up the lime chutes or rotary cooler and becomes heated.

Air coming up through the bottom of the hood is difficult to direct properly. Also it is likely to pick up dust which everyone knows is detrimental to heat exchange. Yet the operating man can experiment to get the air into the kiln in a uniform "sleeve" surrounding the fuel and at the same time direct the air so it will not pick up dust.

Preheating Zone

As to the fifth item of sufficient preheating zone, there is little or nothing that the operating man can do. Most shaft kilns have enough preheating volume, but it is not used properly because of intermittent filling. Performance is helped if the rush of cold stone in the morning is distributed gradually over all the kilns, rather than filling each completely one after the other.

In a rotary, an excessive length of the kiln is required for preheating the stone. This shortens the critical zone around the point of initial calcination so that it must operate at a high temperature of the gas. Preheaters are troublesome, whether of the external or internal type. But they shorten that portion of the kiln needed for preheating. This extra length is then advantageously used by the critical zone above and below the point of initial calcination. This is the zone of least temperature difference between gas and stone. A lengthening of this zone by the use of a preheater permits it to do its work with lower gas temperature and this results in important economy.

Whenever there is poor operation of the kiln for any reason whatsoever, the result is always a higher stack temperature. It can be truly said that high stack temperature is the result of inefficiency and not the cause of it. Any operator can try this for himself if his kiln is equipped with an instrument giving a true reading of the gases coming out of the feed end of the kiln. Give the kiln an excessive amount of air and watch the temperature go up after the kiln stabilizes.

Any saving in operating as outlined in this article results in lower stack temperature. Air preheated by the lime, heat saved around the firing end, perfect combustion with 100 percent theoretical air, all show their saving as lower stack temperature (and lower quantity of gas, hence a double saving).

It must be realized that the stack gases pouring out the feed end of the average rotary kiln are four to five times greater in weight than the lime coming out of the discharge end. And there is no way of forcibly pushing the temperature of the gases down. It can only be done by efficient performance further down the kiln.

REVIEW OF WORK ON ROTARY LIME KILNS

THE INCREASING COST of fuel is causing rotary kiln operators to take steps to improve their efficiency. Work is being done along three lines:

1. Preheaters
2. Internal refractory construction
3. Preheating the air of combustion by regenerative cooling of the lime.

Preheaters

The external type passes hot kiln gases through the voids of the lime. This writer knows of only two such installations, and these both operate on a single size of stone so that they can be adjusted for a reasonably constant pressure head resistance. The problem of release of accumulated dust now appears to be in process of

solution by improved design and practical experience.

Preheaters undoubtedly effect an important economy and improvement in output. But the lime manufacturer who produces his own stone is usually confronted with the necessity of producing three or more sizes of stone in the interest of quarry and crushing efficiency. This introduces the serious problem of variable void resistance to the passage of the gases. It is hoped that this problem will ultimately be solved.

It is to be noted that this type of preheater does a reasonably good job of dust elimination provided all the gases are passed through it. If the problem can be solved, the lime manufacturer will be killing two birds with one stone.

Another type of external preheater is the cross-flow type. None are known to be in successful operation on lime, although there is at least one installation of the Lepol kiln operating on cement. This equipment includes a traveling grate arrangement. For cement, it is necessary to nodulize the feed. This would not be required for sized limestone, but again, there would be the problem of variable stone size. Theoretically this can be taken care of by a fixed measured feed and then vary the speed of the grate. Naturally it should go fast for a thin load of small feed, and slow for a thick load of large sized feed. Victor J. Azbe has shown that with a constant draft loss, the thin load of small stone will preheat as rapidly as the thick load of large stone. Hence it is mechanically possible to get satisfactory preheating of any sized feed provided it is well and uniformly sized between its prescribed limits. But so far, it has not been done.

It is to be noted that the cross-flow preheater is not an efficient heat exchanger. However, since there is always a greater weight of gases than stone, this does not constitute a valid objection.

The internal type of preheater is built into the feed end of the kiln. It consists of a segmentalizing of the kiln with plates of heat resistant steel provided with flights for increased heat exchange area and turbulation of the gases.

As is the case of any rotating device, this preheater takes its load and does its work irrespective of quantity, sizing or grading of the feed. There are a few installations and they show marked economy.

There is considerable maintenance expense and depreciation with this type of preheater. They are subject to operational error of overheating when starting or stopping a kiln. They may be safely installed only in a long kiln. Their best results and longest life have been on long dolomitic kilns where the temperatures are lower.

Improved designs to give greater life are being effected so that it is hoped that the problems of this type of preheater will be solved, and that it will come into greater use in the future. Its simplicity, comparative low cost and ability to function regardless of the size and quantity of feed, justifies serious consideration in future installations. Heat resistant steels are being improved.

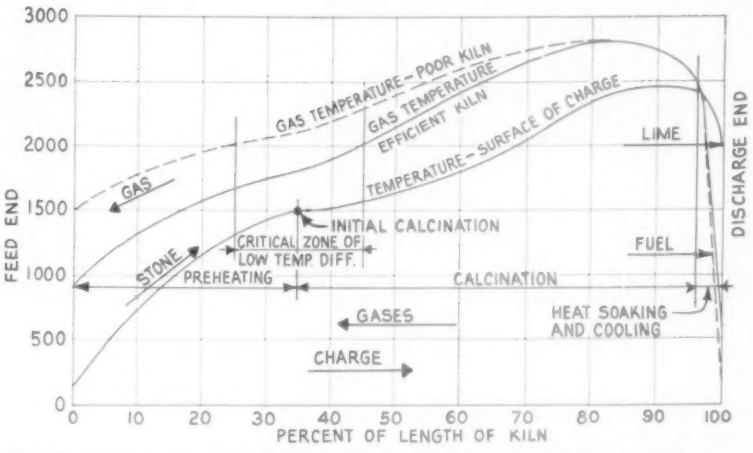


Fig. 1. Typical temperatures in a rotary kiln in percent of length applicable to long or short kilns

As to cost of the internal preheater, it must be noted that it occupies part of the length of the kiln. For example, if 40 ft. of internal preheater is to be used, then it should be charged with 40 ft. of the length of the kiln. In other words, for a comparative cost of internal and external preheater, the kiln with the external preheater may be 40 ft. shorter.

So far, no preheater of any type has succeeded in heating the stone above about 1250 deg. F. As such, it has not reached the "critical zone" which will be discussed under the next heading. There is no way of arbitrarily forcing down the temperature of the stack gases by a preheater. High temperature of stack gases is the result and evidence of inefficiency elsewhere, and not the cause of it.

But the preheater serves this valuable purpose. In the normal cylindrical kiln, too much of the length is required for preheating, perhaps 40 percent or more of the length. The high temperature calcining zone takes care of itself as a good radiant heat exchanger because of the high temperatures prevailing.

In between the primary preheating and the main calcination zones, lies this "critical zone" of low temperature differences and comparatively low temperatures, causing poor radiant heat exchange. This critical zone is crowded in the middle and is all too short. Hence it requires an unnecessarily high gas temperature to do its work.

Therein the preheater serves its purpose. By shortening the length of the kiln necessary for preheating, the critical zone is greatly lengthened percentage-wise, so that it can do its work with a lower gas temperature. This brings us naturally to the next subject under discussion.

Internal Refractory Construction

Fig. 1 shows the temperatures of charge surfaces and gases. This chart is typical for any kiln. It is to be noted that there is a minimum temperature difference at the point of initial calcination. On each side of this point, the temperature difference between gas and charge is small. Since the temperatures themselves are low as compared with those prevailing in the main calcining zone, heat exchange by radiant action is poor. It is to be recalled that radiant heat exchange varies as the difference of the fourth powers of the absolute temperatures.

The dividing point between "high level heat" good for calcination, and "low level heat" good only for preheating, is the temperature of the gases at the point of initial calcination. Table I shows the percentage of high and low level heats available for different dividing points of 1800, 2000 and 2200 deg. F.

It is seen that even with the most efficient kiln that there is insufficient high level heat. All errors of operation, radiation through the shell, etc., aggravate the excess of low level heat. This excess can only appear as hot stack gas.

Serious efforts are being made to make the critical zone more efficient so that it can do its work with a lower gas temperature. This usually includes cross tile construction. It is known that such construction causes a definite increase in efficiency. But so far, an efficient method of long life for such construction has not been developed.

It is hoped that collaboration be-

(Continued on page 195)

PENN-DIXIE'S 500 FT. ROTARY KILN

By BROR NORDBERG

Longest kiln in Western Hemisphere replaces dry process kilns in conversion to wet process at Kingsport, Tenn.

THE TREND TOWARD installation of long, large diameter rotary kilns for increased fuel efficiency and great capacity has reached a new peak with the 12- x 500-ft. wet process rotary kiln at the Kingsport, Tenn., mill of Penn-Dixie Cement Corp. This is the longest kiln in the Western Hemisphere. It was fired up on August 18, 1951, and is expected to maintain a normal daily production of approximately 4200 bbl. of clinker with a fuel consumption of approximately 1,000,000 B.t.u. per bbl. after operations have been stabilized. Feed is a 38 percent slurry and the kiln is direct fired by high-grade bituminous coal from a compartment tube mill.

Like any long kiln installation where previous experience of the burners and other key personnel had been limited to very short kilns, the full use of automatic control features has yet to be fully applied for perfection of operations; yet, the kiln has performed with practically no interruption since it was fired up and is already approaching expected output.

Selection of a kiln of these dimensions was based upon fuel considerations, of course, and to achieve from a single unit a production modestly in excess of the output of six dry process kilns which have been taken out of service. Production of clinker has been increased by approximately 10 percent.

Conversion from a dry process to a wet plant was dictated largely by local considerations. The Kingsport plant was becoming obsolete by modern standards. In order to meet the stringent conditions of the city dust ordinance, conversion to the wet process was, after careful study, considered the most practical solution. Conditions related to efficient dust collection were prime factors in the conversion, coupled with the presence of considerable quantities of plastic clay in the limestone that had proved troublesome in dry grinding in the past.

Kingsport is in mountainous country and the prevailing winds are from the west. The mill is located within the western limits of the city and was the first industry to become established in Kingsport. Over the years, the residential area of the city has spread out and industry has expanded in the immediate area of the plant with the result that the control of dust was essential in any decision to modernize the plant.

Converting to the wet process has eliminated six dry process kilns and has removed dusty conditions that existed in the raw grinding mill department, drying department, in crushing and in handling dry materials. The new kiln is equipped with one of the most efficient combination mechanical and electrical precipitator dust collection systems anywhere, with an expected efficiency in excess of 97 percent in recovery of dust from the exhaust gases.

Prior to the modernization program, there were six 8- x 125-ft. dry process kilns. These kilns were fired by coal prepared in Raymond pulverizers and conventional bin system, with a fuel consumption of 1,400,000 B.t.u. per bbl.

In the conversion, all departments except the raw material handling, clinker grinding, cement storage and packing operations were affected. New preliminary mills for wet grinding were installed in the raw mill in closed

circuit with vibrating screens; two additional tube mills were added and four existing tube mills had to be converted for wet grinding. Six air-agitated slurry storage and blending tanks were built as were two kiln feed slurry basins.

In connection with the kiln, auxiliary major equipment includes an inclined-grate clinker cooler, direct-firing tube mill, mechanical and electrical stack dust collectors, a new stack, induced draft fan and complete instrumentation. Clinker at this plant is stored in concrete silos as contrasted to the more conventional practice in many of the newer plants of using large covered storage areas served by overhead traveling cranes. Only six weeks of shutdown time were required for the complete changeover.

F. L. Smidth & Co. were engineers for the entire program in collaboration with the engineering staff of Penn-Dixie headed by director of engineering Johan Norvig. The kiln, direct-firing mill, kiln slurry feeder, instrument panel, slurry agitating mechanisms and much of the auxiliary equipment are of Smidth manufacture. Tidewater Construction Co. was the general contractor; E. C. Machin built the required slurry basins and clinker silos; the stack was constructed by Rust Engineering Co.

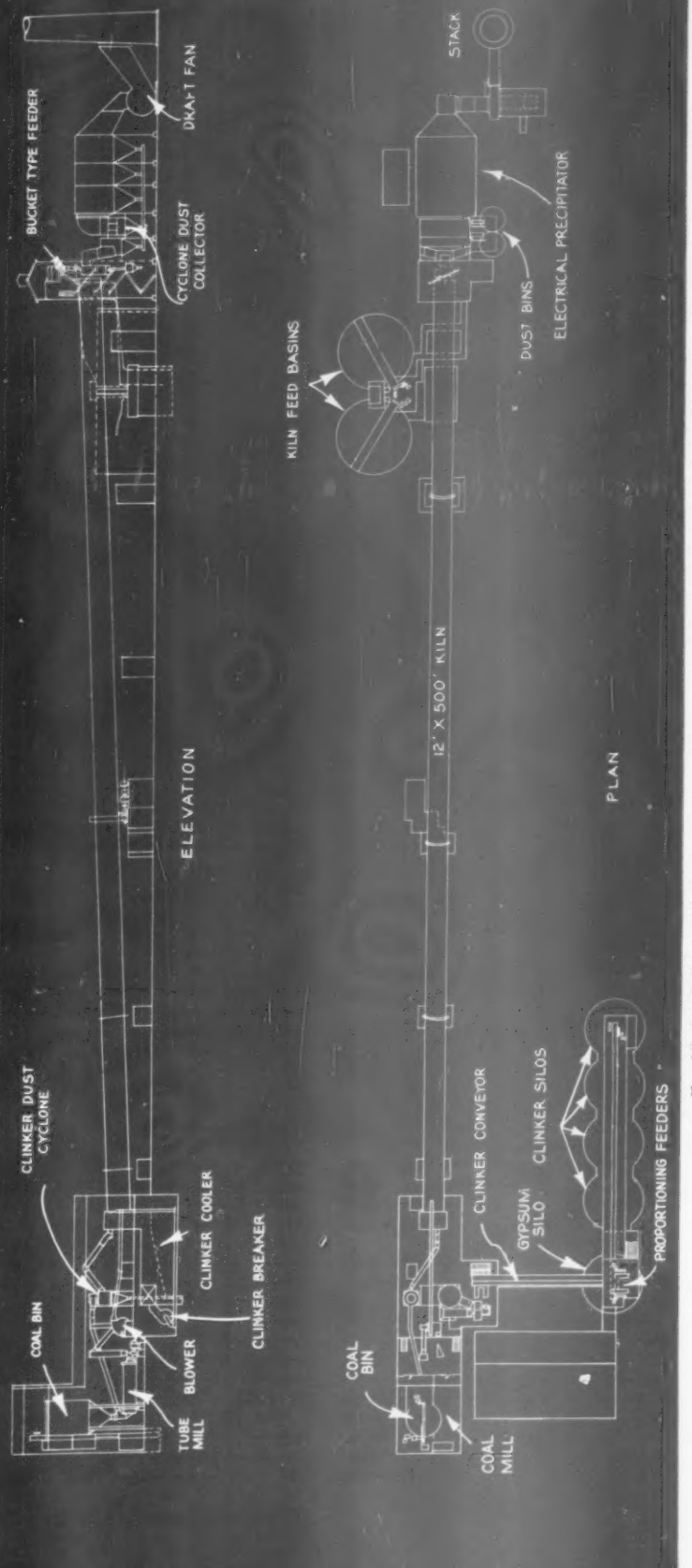
Principal Features

As stated earlier, production of clinker has been increased by 10 percent and the fuel requirement per barrel of clinker will have been reduced by approximately 400,000 B.t.u. This amounts to about 30 lb. of 13,000 B.t.u. coal. Raw grinding capacity has been enlarged so that operations have been reduced from 7 to 5 days per week. Finish grinding has been augmented by addition of one 6- x 22-ft. tube mill. Increased grinding capacity greatly exceeds expectations so that it is now realized that this department can be operated on a five-day schedule because of the improved grindability of the clinker.

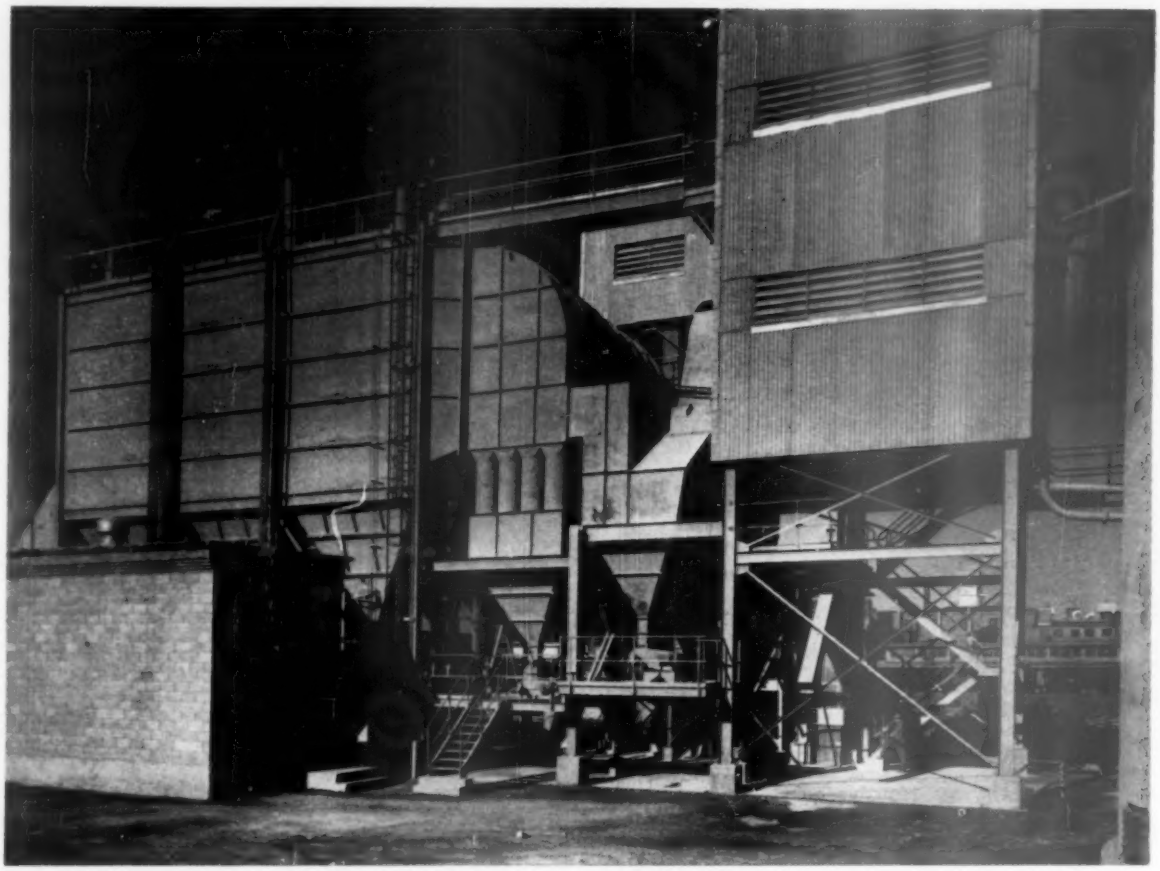
Of special interest, aside from operation of the 12- x 500-ft. rotary kiln itself, is the use of a compartment tube mill for direct firing; the stack dust collector system with its provisions for selective return of the dust to the kiln; and the use of a drive for the kiln, clinker cooler, induced draft fan and other equipment that is entirely new for the portland cement industry.

Penn-Dixie was one of the first cement manufacturers to install an air-swept mill of the ball or tube type for direct-firing kilns, and several other plants of the company have been using this type of mill for some time.

Use of a combination of mechanical and electrical dust collectors for the exit gases has two advantages. It relieves the Cottrell precipitator of work that can be more economically accomplished by the Multiclones, while at the same time isolating the high alkali dust for separate disposi-



New kiln installation included conversion from dry to wet process and two-stage stack dust collection



Stack dust is collected through mechanical and electrical precipitators in series; flexible arrangement of screw conveyors and tanks permits return of of any dust fraction into kiln

tion; dust from the mechanical collector is stored separately from the finer fractions and may be returned into the kiln with fresh slurry at any desired rate. Facilities also provide for introduction of any desired fraction of Cottrell dust to the circulating stream.

Drives

In order to describe the kiln and discuss its operation in any detail it is desirable first to consider its drive, which is new to the cement industry. Power is transmitted to the kiln ring gear through its pinion and gears from a 200-hp. squirrel-cage motor through a Dynamatic water-cooled, eddy-current coupling with a speed range of 0-1160 r.p.m.

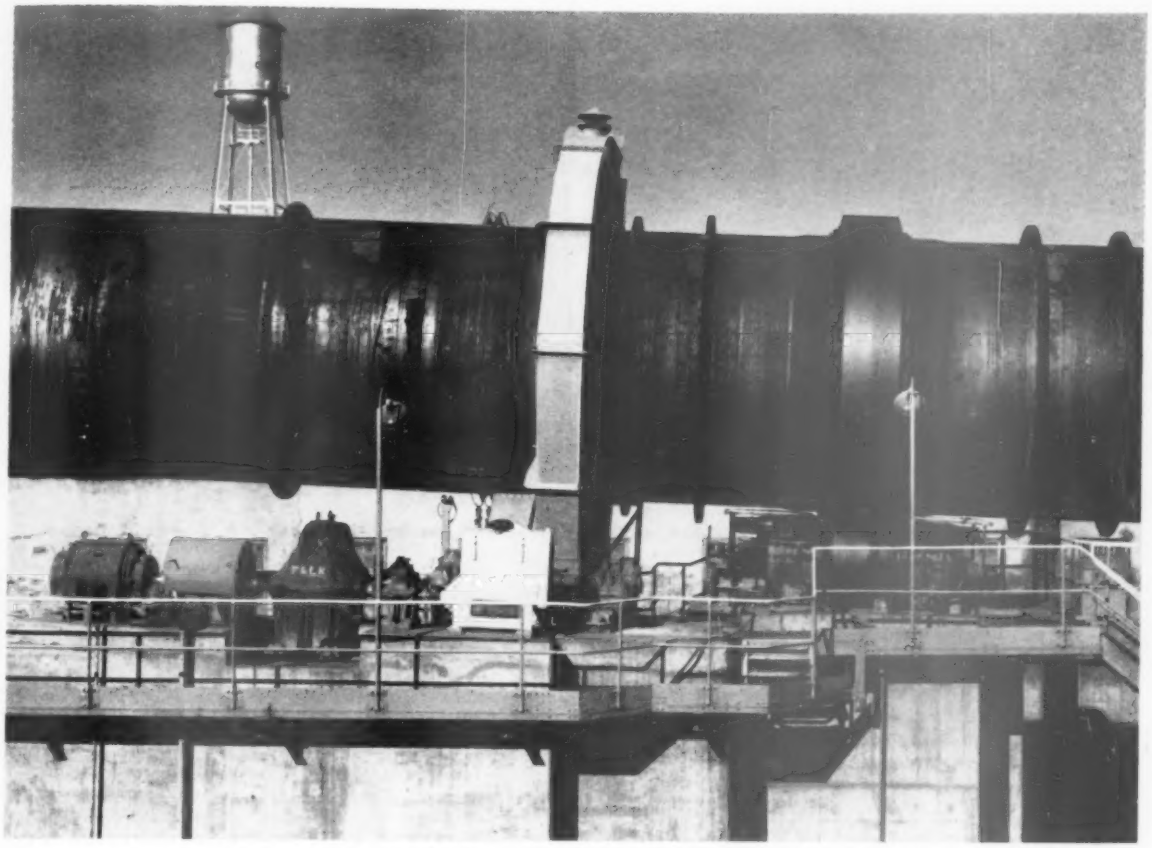
Principle of the Dynamatic coupling drive is that a slip is required between the input and output members in order to develop torque, and the torque capacity varies with the difference in speed between the input and output shafts. The input member is driven at a constant speed from the motor and there is no mechanical connection to the output, or driven, member, the transfer of power being effected by the magnetic attraction between the two.

A field coil on the load side is energized by d-c current fed through two slip rings on the output shaft and, through excitation control, the slip is adjusted to meet load requirements. With the motor at "no load" speed, d-c current supplied the field coil will cause the output shaft to rotate and, through automatic control, the current is readjusted to maintain a desired speed of the output shaft. Direct current for excitation may be supplied from a constant voltage d-c line through a rheostat or potentiometer, or the small amount of d-c current required may be available from an electronic control unit fed by a-c power lines. Automatic speed control is provided through a speed-indicating generator driven by the output shaft which is used in connection with a meter for indicating r.p.m. Voltage is developed proportional to the driven speed and this voltage automatically modulates the control and causes it to supply the exact d-c current to the coil to match a load condition.

The unit has individual shafts and bearings for the input and output members. In the case of the kiln drive, the unit is water-cooled to dissipate the heat resulting from the slip loss. It is claimed that slip loss is about 3 percent on the average and that windage and friction losses are about 2 percent, indicating a full load efficiency of 95 percent for the unit. The coupling is a simple way to obtain adjustable speed from a constant speed motor with full-torque starts, and apparently provides accurate speed control over a wide range.

At Kingsport, this drive principle is applied also to the induced draft fan, the slurry feeder, the dust return screw conveyor, the clinker cooler, coal feeder into the grinding mill, the Raymond mill feeder in the new mortar plant, and pan conveyor. In the case of the induced draft fan, the drive is a 350-hp. synchronous motor through a water-cooled, eddy-current coupling controllable within a range of 0-485 r.p.m. For the smaller drives the coupling and motor are combined into the Dynamatic Ajusto-Spede drive and are 5 hp., 5 hp., 10 hp., 2 hp., 1.5 hp. and 5 hp. for the kiln feeder, the dust return screw conveyor, clinker cooler, coal feeder, Raymond mill feeder and pan conveyor, respectively.

Kiln speed, rate of kiln feed and



Kiln drive is the first in the industry with eddy-current coupling for variable speed control

dust return are synchronized so that manipulation of one control unit at the operating panel, up or down, will maintain the desired relative speed ratios as preset. Adjustment of the draft is done at the control board by adjusting the induced draft fan speed. Incidentally, the louvres at the fan inlet are kept wide open and are not used for draft regulation. The coal feeder drive to the mill is set up for automatic adjustment to maintain the optimum coal level in the tube mill.

Raw Materials

Limestone is shipped in by rail from the company's Marcem quarry in Virginia, 11 miles distant. It is crushed to minus 4 in. at the quarry and delivered over the Southern Railroad, and then to the plant in company-owned cars over the Clinchfield Railroad. Stone is dumped from a tipple, 250 ft. in length, and withdrawn as required to a belt conveyor for reduction to minus $\frac{1}{2}$ in. through a hammermill. It is then stored in eight blending tanks and drawn out from all eight simultaneously over a common belt for transfer to the raw mill. Sand is added to the stream as required by a drag chain, using a table feeder for proportioning.

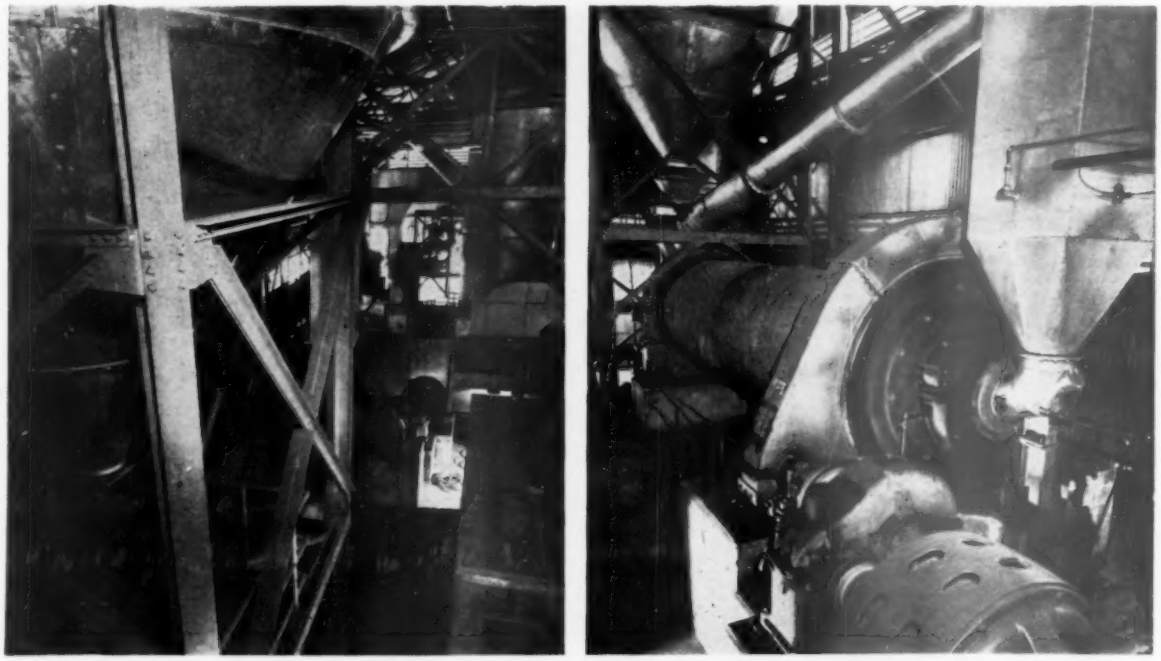
Shale is quarried adjacent to the plant, crushed through a No. 6 gyratory and put into storage. It is reclaimed and put through a hammermill after which a poidometer regulates the rate of feed into a bucket elevator which discharges on the stone belt. Delivery of the blend is by overhead belt conveyor into two separate preliminary mill feed bins.

Raw Mill

Raw grinding is done through two new 8- x 12-ft. Allis-Chalmers preliminary ball mills in closed circuit with vibrating screens, followed by open circuit grinding through six tube mills. The preliminary mills are fed by table feeders and each carries a charge of 60,000 lb. of forged steel grinding balls graded from $1\frac{1}{2}$ in. up to $3\frac{1}{2}$ in. size, 75 percent of the load consisting of $2\frac{1}{2}$-in. balls and larger. Each mill is driven by a 300-hp. motor and produces 150 bbl. per hr. of product for delivery to overhead vibrating screens. Water is added into the preliminary mills to maintain a slurry consistency of 38 percent water as determined by samples taken from a common screw conveyor carrying the slurry from the secondary tube mills to a sump for transfer into the blending tanks.

Product from each preliminary mill is elevated by a water-tight, concrete-encased single-chain bucket elevator and the stream, in each case, is divided over two 4- x 6-ft. single-deck F-300 Ty-Rock vibrating screens with 10-mesh Ton-Cap screen cloth having 0.041-in. actual openings originally. Oversize is returned into the preliminary mill for each circuit and the throughs are transferred by enclosed screw conveyor to a 70-ft. long catenary trough from which the six tube mills are fed. Distribution into the catenary is from a discharge box through pipes to each end. Slurry is distributed and agitated in the catenary trough by a paddle wheel. The catenary is filled first before secondary milling is started and a level is maintained to insure a feed supply to any or all the secondary mills.

Four 5-ft. 6-in. x 22-ft. mills formerly used for dry grinding were fitted with steel hoods and discharge screws in converting them to wet mills. Each has trunnion feed and trunnion discharge, is driven by a 250-hp. motor and carries 60,000 lb. of forged steel balls of 1-in. top size. Two 6- x 22-ft. mills from one of the company's other plants were also installed, each driven by 300-hp. motors and carrying approximately the same ball charge but of slightly larger sized



Kiln is fired by air-swept tube mill, drawing heated air from kiln hood to dry the coal

balls. Feed from the catenary trough to any of the mills is through a 4-in. rubber hose projecting 8 in. through the trunnion plate. The operator need only pull a chain to open or close the slide valve at the catenary to start the feed into a selected mill.

Kiln feed material is ground to 89-90 percent minus 200 mesh at a rate between 4200 and 4800 bbl. in 16 hr., depending upon requirements. Much of the time, five secondary mills are sufficient to meet requirements.

Slurry

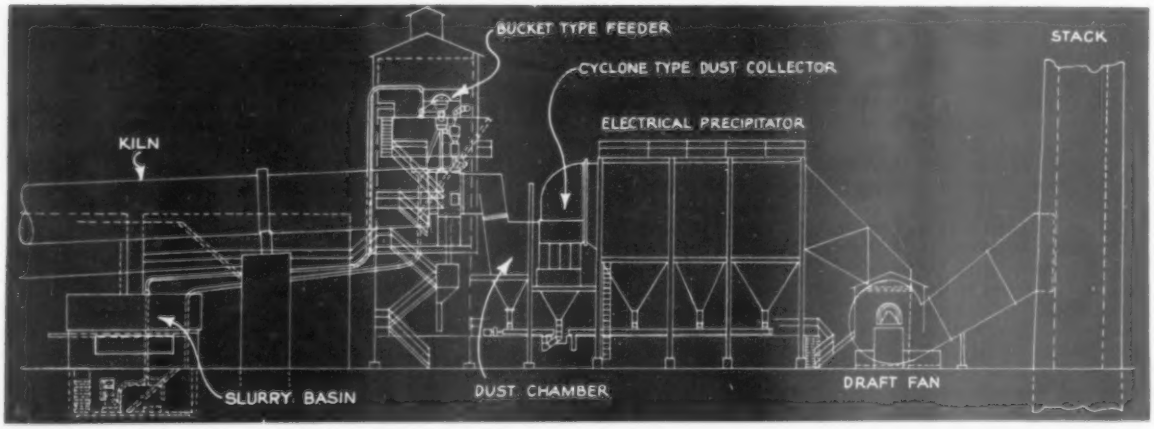
Slurry is conveyed from the raw mill into a sump from which two 5-in. Wilfley pumps are the means of transfer into six correcting tanks of 1200 bbl. equivalent clinker capacity each. Two parallel distribution boxes overhead are the means of filling any of the tanks. The arrangement is flexible for transfer between tanks, recirculation or mixing slurry from any combination of tanks. An automatic sampler draws off a continuous sample from the screw conveyor filling the sump, as a tank is being filled, and check samples are taken by bucket from the top of a filled tank. Mixing is accomplished by FLS pneumatic agitation. Through a time cycle controller, air valves are electrically operated so that there is 2½ min. of blowing per cycle at 90 p.s.i. Timing is such that one or the other tank is always being agitated, the air being introduced from the top down and up from below.

Corrected slurry is pumped by either of two 5-in. Wilfley pumps into either of two 4000-bbl. kiln feed basins adjacent to the feed end of the kiln. The basins are filled and drawn from alternately and the slurry is under continuous mechanical and air agitation. Transfer into the scoop feeder box over the kiln is by either of two 4-in. Wilfley slurry pumps.

Kiln

The kiln shell is all-welded, both circumferentially and longitudinally, and is supported on six 30-in. face floating tires of 12 ft. 8 in. inside diameter and 14 ft. outside diameter. The sixth tire is 14 ft. 4 in. outside diameter with tapered sides for the thrust roller. An oil-lubricated thrust

Arrangement of mechanical and electrical dust collectors in series which permits selective return of dust



roller mechanism guides the kiln in an axial direction and the slope is ½ in. to the foot. There are 36 stiffener rings for the shell. Shell thickness is 2¼ in. for a length of 7 ft. under each tire, with a thickness of 1¼ in. for 8 ft. on each side, and the balance is of 1-in. steel plate. The main pinion and secondary gear turn in two bronze bushed oil-lubricated sleeve bearings. Total weight is 2,225,000 lb.

The kiln has a segmented nose ring of high heat-resistant cast steel and is fired through a burner pipe of heat resistant metal insulated with a 1½-in. covering of asbestos. It has a heat-resisting stainless steel tip. The burner pipe may later be water-cooled.

Heat exchangers at the back end of the kiln consist of a single-density pattern of ⅝-in. chain hung starting 12 ft. from the feed end and extending over a length of 71 ft. Provision has been made to increase this to 86 ft. of chain section. The present length, however, gives excellent nodules of 8 or 9 percent moisture at the discharge end of the chain section.

Lining consists of 70 percent 6-in. alumina brick for a distance of 120 ft. in the hot end of the kiln, followed by about 40 ft. of 50 percent alumina brick and, for the balance on through the chain section, low temperature firebrick.

Thermocouples are provided at two locations in the kiln to measure gas temperatures. One is located just forward of the chain section. Three sampling ports were provided for measurement of moisture at that point. Temperature readings recorded for that point by collector ring and pantograph collector unit are a measure of slurry viscosity and a means to prevent mud rings.

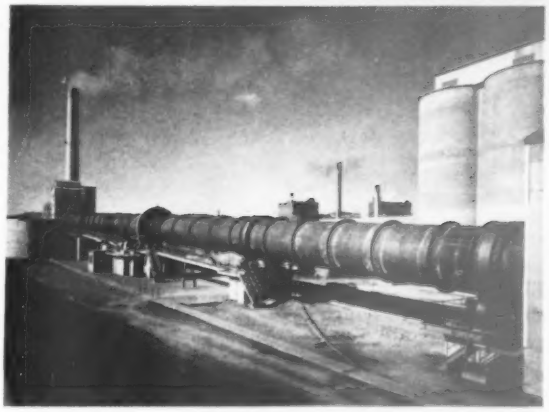
The kiln drive is located at the mid-point over the third pier and consists of a 200-hp. squirrel-cage motor through a Falk coupling to the Dynamatic water-cooled, eddy-current coupling, which has its output shaft connected to a Falk double-reduction 32.5:1 gear reducer which in turn is engaged to a Falk coupling to the pinion drive to the master pinion and then the ring gear. A 44-hp. gasoline engine is provided to turn the kiln at ⅛ r.p.m. in event of power failure. A double-reduction reducer and flexible coupling are the means of transfer of power to the high-speed shaft of the reducer.

Coal Handling

The kiln is fired with a 13,000 B.t.u. Virginia coal of 8-10 percent ash content. A minus ¼-in. grade was used in the dry process operation which employed dryers but a minus ¾-in. product is now specified for better drainage and ease in handling. Coal is conveyed from the track hopper by screw conveyor which delivers into the boot of an enclosed bucket elevator for transfer into an overhead 122-ton steel bin from which the coal mill is fed. If unusual moisture conditions prevail, the coal may first be put through the dryer.

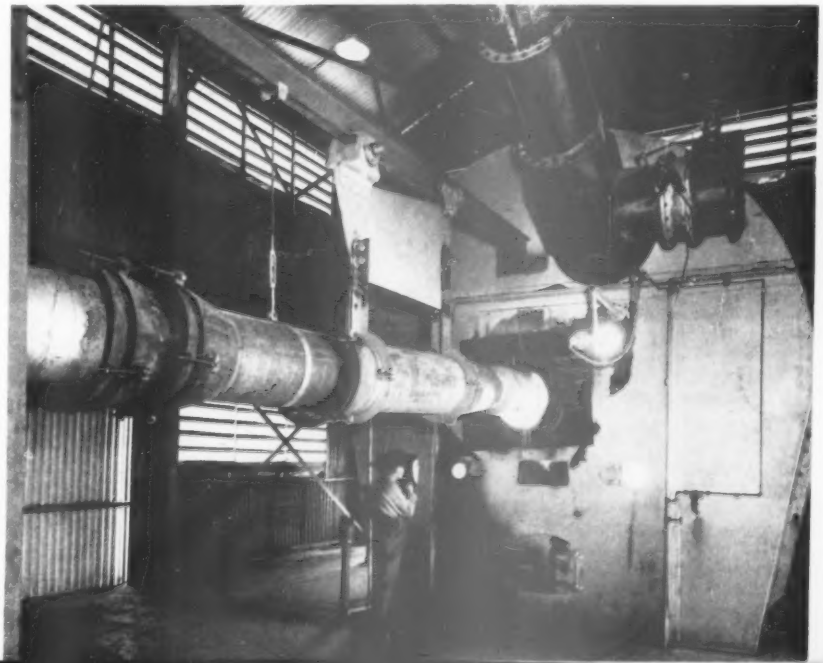
The bin has a steep-pitched conical bottom, and a 12- x 15-in. pusher-type feeder is the means of feed regulation into the mill. It has variable speed drive and a stroke range of 4 to 6 in. Grinding is done through an air-swept Tirax coal mill 28 ft. 3 in. in length and with a 6 ft. 6 in. outside diameter. Feed is into a drying chamber 9 ft. 6 in. in length, which is followed by grinding compartments 8 ft. 6 in. and 10 ft. 3 in. long, respec-

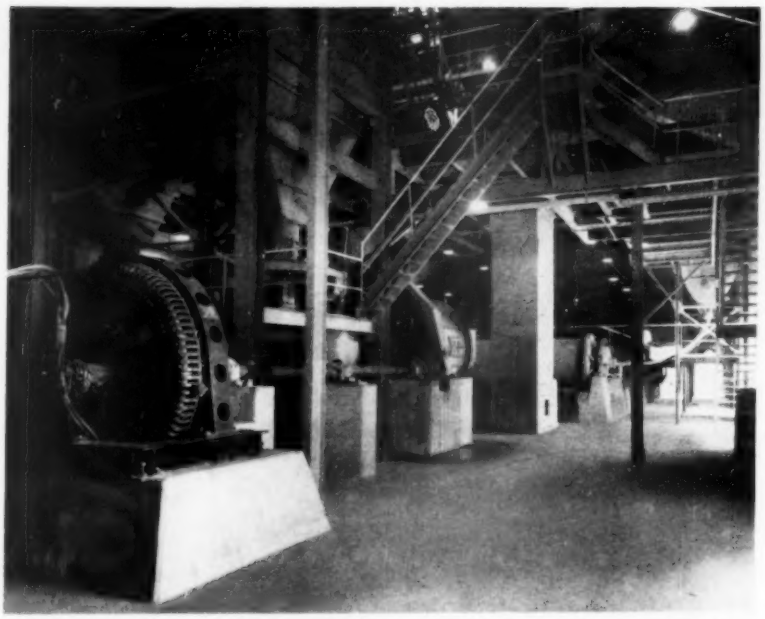
View of 500-ft. kiln taken from feed end. Clinker is stored in silos shown in back of kiln



Kiln as seen from firing end. Slurry basins are visible in background

Telescoping burner pipe permits easy repositioning of flame





Preliminary raw grinding mill in left foreground; secondary mills in background are fed from catenary trough

tively. The mill is driven by a 250-hp., 580 r.p.m. motor through Farrel-Birmingham gear at constant speed and carries a ball charge of 38,000 lb. consisting of 6600 lb. of 2 in. size, 6600 lb. of 1½ in., 3300 lb. of 1¼ in. and 21,500 lb. of ⅞-¾ in.

Heated air from the kiln hood is drawn through the mill from the feed end and the coal-air mix blown into the kiln by a fan driven through V-belt from a 100-hp. variable speed motor. Fineness of grind is approximately 70 percent through a 200-mesh sieve. Through insulating the piping from the kiln hood it is expected that preheated air will be introduced into the mill drying chamber at 600 deg. F. and that the temperature of the coal-air mixture will be maintained at 180 deg. F. as it enters the kiln. Tempering air will be introduced automatically through a damper at the kiln hood actuated by an air motor in accordance with the temperature desired at the discharge end of the mill.

The mill has a manometer device for mill level control whereby the differential pressure between the air stream and the pool of coal is tied to the coal feeder which is variable-speed driven through a Dynamatic Ajusto-Spede coupling. This is set up for automatic operation later so that when the fire into the kiln is changed, the rate of coal feed into the mill will adjust accordingly and the mill level be held constant.

Kiln Feed

Slurry is fed into the kiln at 38 percent consistency by a special scoop slurry feeder of the single type with constant overflow which is adjustable as to height. The paddle feeder creates impulses which keep lights flickering on the kiln control board as an indication that the flow is continuous. As stated earlier the drive is through an Ajusto-Spede coupling and is synchronous with the kiln speed.

Dust Collection

Exit gases exhaust from the kiln at 600 deg. F. into a dust chamber measuring 17 ft. wide by 16 ft. deep by 32 ft. high. Considerable dust is settled in the hoppers of this chamber before the gases enter the collector system. By the combination of a cyclone-type collector and an electrical precipitator, any part of the heavier fraction may be returned into the kiln with the fresh slurry feed. At present, a small fraction of the dust is being fed back into the kiln; more will be thus recovered as experience is gained with the kiln.

The combination collector is a Western Precipitation Corp. CMP unit consisting first of a type 24VD Multiclone, size 48-4, and a 3-unit Cottrell precipitator which has two rod curtain sections followed by one pocket electrode-type section. As a unit, the system is guaranteed for an efficiency of 96 percent based on handling 180,000 c.f.m. of gas at 670 deg. F., with 25-30 percent moisture by volume at 1200 ft. elevation. It is expected that the efficiency actually will be 97.5 percent recovery.

The conveying system for dust comprises screw conveyors and cross screw conveyors so arranged that the dust recovered in the dust chamber hoppers plus that from the Multiclones and the first section of the Cottrell is conveyed into one closed storage tank. That from the third, or final, section of the Cottrell is conveyed into a second tank while that from the second section may be put into either tank. Dust from the first tank may be fed out to a controlled amount into a screw conveyor and is then elevated to discharge into a pot mixer for blending with the slurry. Dust from the other tank which contains the extremely fine particles is disposed of by trucks with bulk cement-type bodies. Similarly, dust not returned into the kiln from the other tank may be wasted.

Gases are exhausted by a Buffalo fan driven by a 350-hp. synchronous motor and a Dynamatic water-cooled eddy-current coupling through a new 225-ft. stack. The stack is brick-lined for its entire height and has an air pocket between the inner and outer shells. Draft is adjusted by changes to the fan speed, controllable from the burner's station.

Clinker is discharged over a 7- x 44-ft. Fuller inclined-grate clinker cooler from the kiln, equipped with clinker chunk breaker at its discharge. Secondary air for combustion is preheated through the clinker bed. Excess air is vented through a Multiclone dust collector and the dust returned into the clinker conveyor. Clinker is conveyed by enclosed drag chain and elevator into four 10,000 bbl. clinker silos arranged in a single row. An 800-ton gypsum bin at one end permits proportioning by Waytrols to a common belt conveyor below in withdrawing to fill the finish mill feed bins. Cement is ground by ten Griffin mills followed by four 7- x 22-ft. tube mills in closed circuit.

Instrumentation

All instruments are centralized at the FLS control panel which is a dust-proof cubicle. Draft fan speed is indicated by a meter from the Dynamatic drive. Draft is measured and transmitted by a Brown indicator-recorder. Temperature is recorded as measured by the kiln thermocouple and the exit gas temperature is also recorded and indicated on Brown instruments. As an extra precaution, a Brown pyrovane alarm has been provided to guard against excessive temperatures of discharge gases as well as at the end of the chain section. Slurry feeder speed is indicated by meter from its Ajusto-Spede drive. Flue gas analysis as measured by a Cambridge gas analyzer is indicated and recorded on a potentiometer. Kiln speed is indicated by a meter from the Dynamatic drive circuit and also is recorded.

Temperature of the lining in the hot zone is measured by a Brown Radiamatic pyrometer and recorded on a 4-pt. recording potentiometer, along with the slurry feeder speed, the kiln speed and coal feeder speed. Draft as

measured at the hood is indicated on a Hays vertical gauge.

Exit temperature from the coal mill is indicated by a Brown recorder-controller which controls the tempering damper on the preheated air at the kiln hood as drawn for introduction into the coal mill. Pressure across the coal mill is indicated by a Hays instrument. The coal mill level is recorded by a recorder-controller and will control the speed of the coal feeder drive.

For the clinker cooler, a Brown temperature-controller controls the bed speed through the Ajusto-Spede drive. Hays gauges indicate the pressures below the clinker bed. A pressure controller will control the position of the cooler vent dampers according to the pressures above the clinker bed. Other instruments either record or indicate feed end gas temperatures, kiln speed and other variables, and all the ammeters, stop and start switches and emergency controls are concentrated on the main panel.

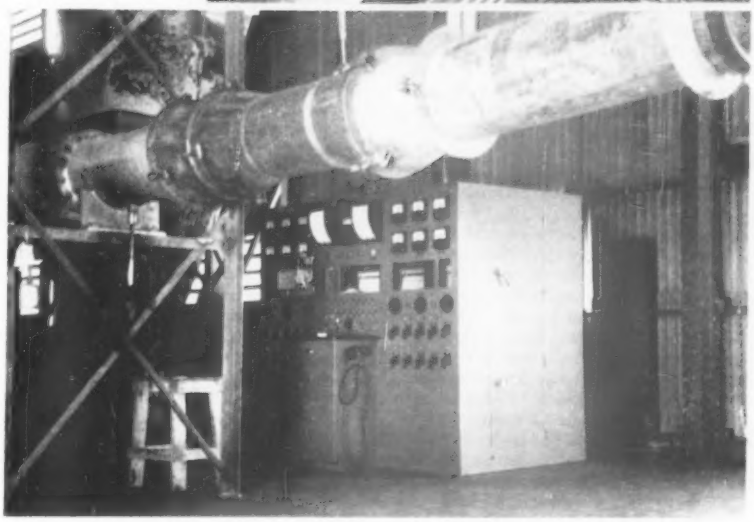
One of the considerations in selecting a kiln of such size was to have sufficient capacity that it could be operated at its best performance rate rather than push it to peaks that have adverse operating effects. Maximum production of 4400 bbl. per day at kiln speed of 65 r.p.h. has been attained up to this time.

Thus far there has been no difficulty with mud rings. Temperature just below the chain section is held at 1250 deg. F. in order to have a moisture content of about 9 percent which yields excellent nodules. Similarly, there has been little difficulty with slag rings in the hot zone. The burner pipe is telescopic with a range in adjustment of 30 in., from a point 18 in. outside the kiln nose to extending 1 ft. inside, which permits repositioning the flame for minimizing ring formation or loosening rings that may start to build. The gas analyzer will be used as a guide to govern the firing rate of the kiln, particularly according to O_2 readings. At this stage the operating crew is still inexperienced in long-kiln operation and, as a result, some of the instruments are not yet in regular use.

Mortar Plant

Aside from the kiln installation, which is the subject of this article, the company has recently placed in operation a new addition to the mortar plant on the other side of the railroad from the main plant. Limestone is discharged from cars alongside and put through a hammermill via pan conveyor for reduction to ¾ in. minus. This product is fed from an overhead bin into a 6-roll Raymond mill with whizzer classifiers for reduction to 89 percent minus a 200-mesh sieve. The pulverized limestone is pumped to the manufacturing end where it is proportioned with high gypsum cement and plasticizing agents for final grinding through tube mills.

Continuous gas analyzer at exhaust end of kiln is a check on combustion efficiency



Instruments for all kiln operations are centralized on this control board. Telescoping burner pipe is overhead

Personnel

E. P. Newhard is vice-president and operating manager of Penn-Dixie Cement Corp; Johan Norvig, director of engineering; F. H. Compton, chief engineer; J. Sorteberg, electrical engineer, and W. P. Gano, chemical engineer, with headquarters at Nazareth, Penn. M. T. O'Connor is superintendent at Kingsport and Coy H. Pickens is chief chemist.

School of Mines Scholarships

COLUMBIA UNIVERSITY, New York, N. Y., has announced the availability of several Henry Krumb scholarships to be awarded to students working for their B.S., M.S. or E.M. degrees in the School of Mines, Columbia University. The value of each scholarship is $1000 per year, together with the cost of transportation from the student's home, or port of entry, within the United States to New York City.

Application blanks and announcements may be secured by writing to the Office of University Admissions, Columbia University, New York 27, N. Y. The applications, when returned to Columbia University, should be accompanied by certified transcripts of academic records and supporting letters of recommendation in accordance with the directions on the form, before February 20, 1952.

Phosphate Mining

PHOSPHATE MINING OPERATIONS at Fort White, Fla., which were abandoned during World War I, are being resumed this month with the completion of the Lake City Junction plant of Loncala Phosphate Co.

Hardrock phosphate was mined extensively in that area from 1880 to 1914, and at one time there were 12 mines. The product of the new industry, however, is not hardrock phosphate, but colloidal phosphate or phosphatic clay, the result of the washings of the old hardrock operations. The high-grade colloidal phosphate is used as an ingredient in the production of animal mineral feeds. It was first used in this capacity in 1940 as a substitute for bone meal which is costlier. The Loncala company ships this to various points from Winnipeg, Can., to Portland, Ore.

Economic Contributions of the Seismograph to the Quarry Industry

Formerly used principally in arbitration of blasting damage, instrument control is proving valuable in effective use of blasting energy

By JULES E. JENKINS*

INSTRUMENTS WITHIN THE SPAN of a few decades have become to industry what eyes and ears are to the human being. In fact, all of the senses might be included because instruments do everything but duplicate the creative mental processes, and they are approaching that. Persons who are engaged in the design, development and use of instruments have long recognized the need for gaining "top brass" recognition for devices for measurement, inspection, testing and control as tools for increasing and safeguarding profits. All too frequently company executives regard instrumentation as something for the engineering department to worry about. Conversely, the engineering department is often hard pressed to stimulate more than passing management interest in the contributions of instruments for directly increasing productivity. An example of short-range management viewpoint may be found among producers of rock products who collectively comprise the crushed stone industry, whenever the use of seismographic instrumentation, for other than litigation or blasting complaint investigation, is suggested.

That these producers in general cling to this outmoded concept is probably due to the fact that the first application of seismographic instrumentation to quarry blasting was primarily devoted to evaluating the vibratory effect from dynamite blasts upon buildings, for the purpose of providing useful information in the settlement of blasting damage claims or the defense of legal actions resulting therefrom.

The Damage Index promulgated as the result of the original seismographic measurements provided the first reliable vibration criterion. Since its publication, this reference has withstood the test of time and the courts, and may be credited as having been directly responsible for effecting substantial savings, throughout the industry, in refuting or defending claims which otherwise might have been allowed. This, then, was the first economic contribution of the seismograph to the quarry industry.

Although the scope of this first research was primarily committed to assessing damage limits for blasting vibrations, these early studies frequently indicated other avenues deserving of exploration. Such tangent aspects were left for future investigation. Science does not stand still. Having established an index for damage, seismographic investigations were next directed to exploring some of the tangents suggested by the basic research program. The results of these secondary studies point the way for still greater economic contributions of the seismograph to the quarry industry, entirely independent of its role in the defense of damage claims or lawsuits. Thus, the seismograph, as adapted to quarry seismology, may be regarded as having passed from the era of *recording* and as now entering upon the era of *seismic control and analyses*. Before discussing these future applications let us briefly review some of its accomplishments during the era of recording.

Era of Recording

The history of the adaptation of seismographic instrumentation to quarry seismology dates back to the early '20's and the development of the "pin machines." The behavior of the pins under blast agitation contributed the knowledge that the vibratory aftermath was not of "earthquake" magnitude as many persons first believed. The measure of pin reaction was dependent upon estimates derived from visual observations, hence were subject to all of the inaccuracies normal to such observations. Furthermore, different observers noted different reactions and this at times led to disputes. These circumstances fostered the demand for more precise measurement methods, also a means for automatic registration so that permanent records could be obtained.

Between 1930 and 1936 great strides were made in the development of single component recording seismographs. As the description implies, single component instruments are confined to one plane of measurement. Thus, during these years, in order to obtain a three-plane measurement, vast batteries of instruments had to be employed—three of everything. Many man-hours were required to ready these instruments for field operation. Often this resulted in costly delays in plant operation.

The remainder of the '30's was given over to perfecting field measurement techniques and the review of data with view to determining quantitative values. As one of the early investigators reported, "a great deal of time was spent on learning what not to do rather than on how to do it."

Three-component seismograph

Thereafter, through the war years of the '40's, instrumental development in all fields underwent a tremendous upsurge. Radar, underwater sound detection, remote control for aircraft and guided missiles, and atomic energy may be cited as a few of the better known developments of this period. Apace with the rest, advancements in seismographic instrumentation resulted in the consolidation of the single component seismograph into one complete three-component portable unit.

No longer is the seismologist compelled to descend upon a quarry with a truck load of instruments and auxiliary equipment. No longer does he require many hours to ready it for operation. Under present day procedure, he moves in, places the seismographs in operation in the matter of minutes, and changes, if required, to several different recording locations during the course of the working day, all without interruption or delay in routine blasting schedules. At the end of the day he is on his way with complete seismograms from which all essential information may be obtained. The efficiency of this improved measurement procedure has effectively lowered the cost of seismographic investigations. This may be regarded as the second major economic contribution of the seismograph to the quarry industry.

Following the termination of the basic research program of the '30's and continuing through 1945, dynamiting operations of every description

*Vibration Measurement Engineers, Chicago, Ill.

were investigated. Blasts utilizing explosive charges ranging from 5 lb. to 1,300,000 lb. were measured. The tests included such operations as quarries, strip coal mines, deep shaft mines, river dredging, building excavations, rock cuts in highway construction, subway, tunnel and deep interceptor sewers, ditching and trenching, and even the blasting of tree stumps. The prime objective for most of these tests was the correlation of individual operations data with the newly established Damage Index. Excepting deep mine and tunnel blasting, the universal practice for detonating prime open face blasts in those years was by instantaneous methods. The advent of split-second detonation witnessed a rapid discarding of instantaneous practice in favor of this newer method.

Millisecond Delay Detonation

Split-second delay detonation or what has come to be known as millisecond (*MS*) timing, was introduced to the quarry industry in the fall of 1945. As the name suggests, millisecond timing refers to the interval, in thousandths of a second, between the successive discharge of each blast hole in a multiple hole blast. The original method employed a three-cap series of special electric blasting caps.

In addition to vastly improved quarry performance, seismographic measurements of blasts discharged by this new type detonator indicated amazing reductions in the vibratory effects. By mid-summer of 1946, this new product gained widespread acceptance throughout the quarry industry. The instant success of this detonator hastened competition between explosives manufacturers, and there followed an approximate two-year period during which several types of millisecond blasting switches were perfected, and the original three-cap electric blasting cap series extended to the ten to 16 cap series now available in the market.

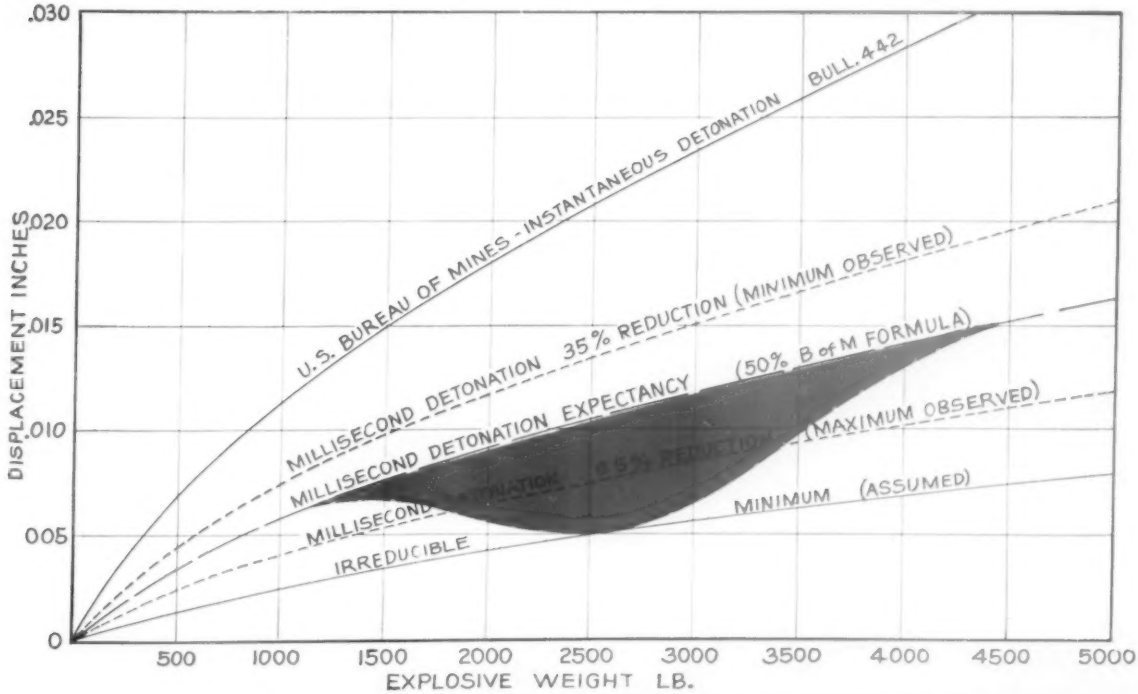
Considerable confusion resulted from all of this rapid, intensive and simultaneous development of competitive millisecond firing methods. What was the proper interval of time between successive holes? Were caps preferable to the switch or vice versa? These questions were discussed and debated wherever and whenever interested parties met. It was only natural that the seismographic activities of this period were more or less confined to testing the relative merits of the various millisecond products and observing the effects of differences in the timing intervals.

Seismologists are frequently asked to explain the reasons for the exceptional performance of millisecond detonation. Many theories have been advanced but as yet remain to be proved. The consistency of performance suggests more efficient utilization of the total explosive energy throughout the working face. This finds some support in the trend of vibration characteristics. Until methods are devised and instrumentation fully developed so as to permit the conduct of measurements within the zone of blast turbulence, the exact behavior of the energy following the moment of its release must remain a matter of conjecture. Seismographic instrumentation designed for this purpose is progressing slowly and preliminary results are confusing and unreliable. Meanwhile, working with end results, seismology has uncovered important new trends that hold great promise for further economic contributions by the seismograph to the quarry industry.

Era of Control and Analysis

It will be recalled that prior to the introduction of millisecond firing methods, instantaneous detonation of primary blasts was universal practice. The belief commonly prevailing prior to the basic research program was that the vibrational effect increased in proportion to the square root of the explosive load. The empirical formula developed by the United States Bureau of Mines, Bulletin 442 (1942), as referred to instantaneous quarry blasting, found that this concept did not hold but that the vibration actually increased in proportion to the two-thirds power of the weight of the explosive charge. The well-known Weight-for-Distance Tables prepared by the Bureau of Mines were based upon this relationship.

First seismographic measurements of millisecond blasts indicated vibration reductions ranging from 35 to 65 percent. Since these reductions were found to be consistent with the passage of time, it became increasingly



Graphic illustration of the "vibration dip" characteristic; colored area represents increased efficiency attainable through seismic control methods

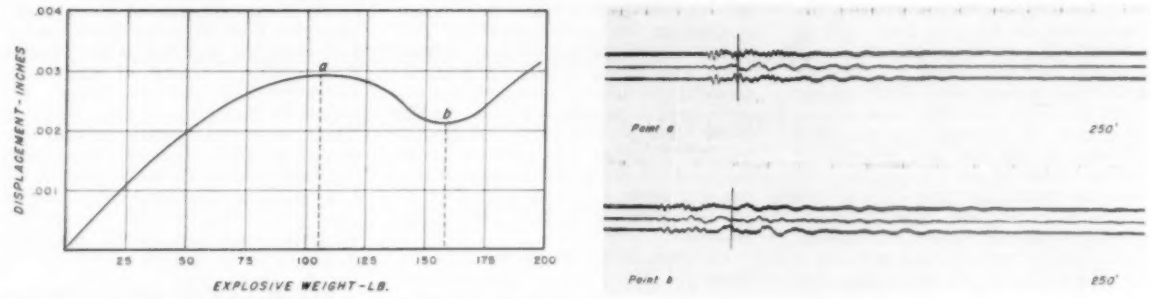


Fig. 1: Maximum and minimum amplitudes (left) for an explosive loading up to 200 lb., and the corresponding seismograms for the two points (right)

apparent that an entirely new set of seismographic facts would have to be established.

After the confusion attending the first use of millisecond methods had subsided, seismographic investigations were directed to a wide variety of blasts employing this firing method. In the four-year period 1948-1951, enough vibration data have been assembled to enable the reporting of certain important and heretofore unknown trends. As yet, these findings must be treated in the nature of a progress report subject to such modifications as future investigations may dictate.

When a comprehensive set of millisecond records was available for plotting, it was found that the amplitudes were approximately one-half the value computed according to the Bureau of Mines formula. It was further found that this relationship existed up to a point after which the amplitude decreased to a minimum value. Thereafter, the amplitude continued to rise until it again became consistent with the original trend, that is, back to the 50 percent values of the Bureau of Mines formula. Since this trend has been found to persist in test data for small, medium and large sized blasting operations, it may well be described as the "vibration dip" characteristic.

In seeking an explanation at this stage for the occurrence of this vibration dip, the laws governing the dissipation of energy seem to apply best. Blast-generated earthborne vibration transmitting beyond the shot point area classifies as residual energy. This residue may be considered as being composed of two parts: the irreducible minimum and waste.

Since for every action there must be an equal and opposite reaction, the explosive forces acting to dislodge the earth materials from the blasting face also exert a force against the earth mass behind the shot point. This force compresses the earth mass giving rise to the elastic waves, the motion of which creates the phenomenon known as vibration. When the amplitude of these elastic waves is excessive, it may be presumed that such excess is the result of a part of the source energy having been wasted.

This presumption rightly prompts the question, how can it be determined when the amplitude is, or is not, excessive? As of now, the answer to this question is dependent upon a sufficient amount of vibration data being available to enable the plotting of a curve through points of minimum amplitude. Such curve may then be regarded as approaching the irreducible minimum. Amplitudes in excess of these minimum values may then be presumed to represent waste.

From the records thus far available for analytical study, the minimum amplitudes at the low point of the vibration dip indicate that the decreases resulting from this dip are of the order of 33 percent below maximum amplitudes. This is evident by inspection of the accompanying graphs. For small operations (Fig. 1) employing explosive loadings up to 200 lb., the vibration dip lies between 0.0029 in. and 0.0021 in., a drop of 26 percent; for medium operations (Fig. 2) employing 1000-4000 lb. explosive loadings the dip from 0.013 in. to 0.005 in. is about 38 percent; for large operations (Fig. 3) employing explosive loadings in excess of 10,000 lb., the dip decreases from 0.006 in. to 0.004 in. or 33 percent.

These curves serve to illustrate that under a comprehensive program of seismographic control, it is possible to discharge blasts utilizing larger explosive loadings and achieve greater shot point efficiency than is obtained from blasts of lesser explosive charges. To accomplish this demands much closer shot point supervision than heretofore and calls for revised thinking on the part of most quarry operators. By and large, present day shot point practices are the outgrowth of trial and error methods which have been found to work sufficiently well to permit profitable continuance. The same operator who pours over cost sheets seeking fractional-cent savings here and there at other points within his plant frequently pays scant heed to dollar wastage at the very source of his production. It is seldom considered that if the modification of one of the shot point conditions results in consistent reduction of the maximum vibrational effect by 33 percent, assuming another 33 percent of this energy to constitute the irreducible minimum, the end product is a 50 percent reduction in the waste energy, or, conversely, a 50 percent increase in the blast efficiency.

What are some of the source conditions that must be supervised carefully in order to obtain this efficiency and its attendant savings?

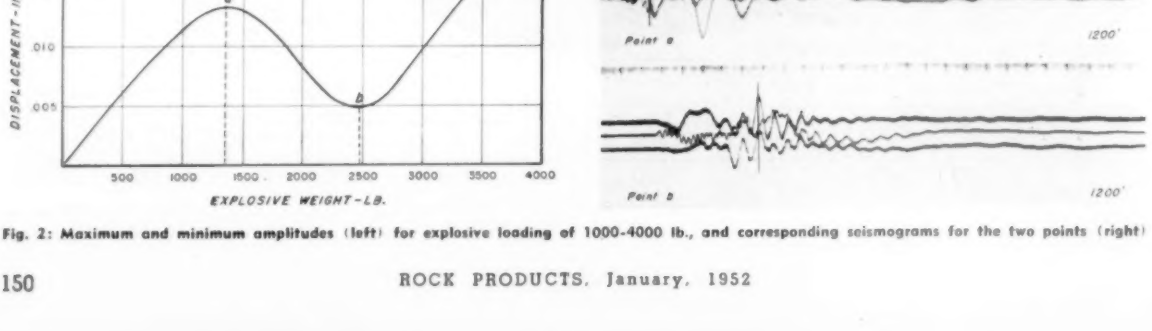


Fig. 2: Maximum and minimum amplitudes (left) for explosive loading of 1000-4000 lb., and corresponding seismograms for the two points (right)

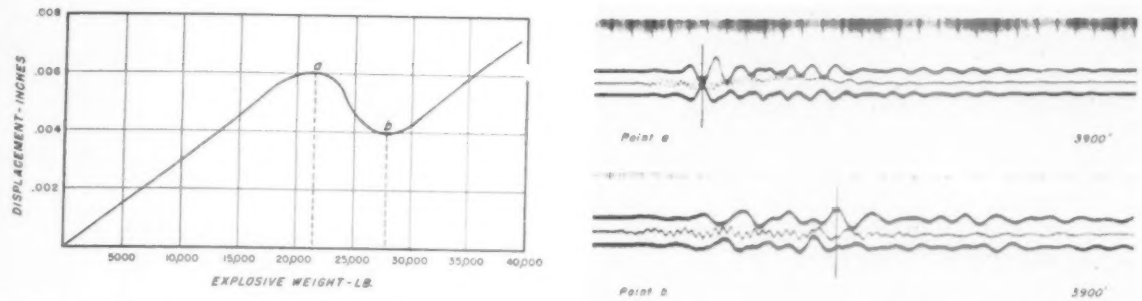


Fig. 3: Maximum and minimum amplitudes (left) for an explosive loading in excess of 10,000 lb., and the corresponding seismograms for the two points (right)

At the outset, blast hole spacings should be arranged into groups of experimental dimensions, so as to permit seismographic determination of the burden and spacing best suited to local operating needs and terrain. Attention should be given to any radical changes in the density or stratification of the rock. Different dimensions to accommodate such changes should be developed. Lack of attention to this important detail frequently results in large energy losses at the shot point.

Once proper burden and spacing of the blast holes are determined, this information should be followed with precision, not by pacing the distances or using some convenient stick but with a tape measure. "Oh," it may be argued, "but our face is interspersed with mud seams so we must have latitude in order to miss them." Adequate seismographic data overcome this objection by finding a way around these "pockets" by providing the operator with a choice of several burden and spacing dimensions to utilize the maximum explosive energy.

The optimum number of blast holes to be discharged as a single detonation should be investigated. This is best accomplished by a program of progressive build-up whereby the size of each blast is increased in 1-hole, 2-hole or 3-hole stages, until the desired information is obtained. Whatever build-up stage is determined upon should be maintained throughout the test period. The progression should not be varied by adding one hole for one test and three holes for another, and so on, since this may be expected to provide unsatisfactory seismographic data. This part of the investigation should not be hurried and for best results should be repeated at least twice.

Various schemes of detonation should be checked. Millisecond detonators should be used. In some cases, millisecond electric blasting caps are found to give better performance than the millisecond blasting switch. In other cases, the switch will prove superior. This has nothing to do with the product but depends upon the time interval best suited to local conditions. Both systems should be tried.

Explosive loadings should be carefully controlled. Powder ratios for each hole should be computed in advance, not following the blast, and the weight of the explosive charge in each hole should conform to the burden each hole is carrying. Rule of thumb methods should be discarded. Strengths and types of explosives used should be governed by the recommendations of the explosives manufacturer.

"We do all of these things," the quarryman insists, "but if we undertook to do them so as to include all of the minor details suggested, with labor costs what they are, plus the cost of seismograph tests, our blasting costs would probably rise to a point where they would offset or exceed the possible savings." The answer to this line of reasoning may be summed up by saying that from the review of a vast array of seismic data, it is apparent that the average quarryman, who is of the belief that he is "doing all of these things," has not, in fact, followed through. After the completion of what can be termed "token" investigations, it usually happens that the work sinks back into routine procedures, old habits again predominate and details are forgotten, with the result that only a fractional part of the potential efficiency is attained. Only by strict and constant control can the ultimate benefits of seismic control and analysis be achieved.

An outstanding example of "follow through" may be cited of the quarry where it was found from the seismic data that the 8- x 8-ft. burden and spacings could be increased to 12 x 18 ft. Under these increased dimensions, only ten drill holes did the job which previously required 30 drill holes, or 67 percent less drilling. The savings in drilling costs alone covered the cost of the seismograph tests several times over and left the operators with this information after the test program was completed. Spread out over time, the test costs faded into insignificance. Moreover, better rock breakage obtained by the more efficient blasts was credited with having reduced delays at the crusher head at least one hour per day. When figured against the hourly cost of plant operations, this saving alone is equal to 12 percent.

In summary, any program of seismic control and analyses should be directed to (1) obtaining a sufficient number of seismographic records under (2) controlled shot point conditions from (2) relative positions of measurement. Such program will provide the basic information for determining optimum blasting procedures.

It is of general interest that the first indication of the effects which have been described as the vibration dip was observed in the records of a few random and widely scattered measurements. These data were first regarded as inconsistencies and remained in this category until a greater volume of records was available for analysis. A few case histories which aided in the development of this new found trend are presented here.

Case Histories

Case A. This limestone quarry is located within the confines of a medium sized city and is adjacent to privately owned dwellings. The quarry operations classify as small. Blasting operations are restricted by city ordinance to not more than 50 lb. of explosives in any one blast. The prime purpose of the seismograph tests was to demonstrate, for the edification of the municipal authorities, that the ordinance restrictions actually defeated the protection it sought to bestow. The first seismograph tests engaged the 3-hole blasts regularly discharged and about which one neighbor chronically complained. For test purposes, the blasts were progressively increased in 3-hole stages, from six through 15 holes. All holes were uniformly loaded with the same explosive charge as for the regular 3-hole blasts. The seismograph control station was established 250 ft. behind and at right angles to the line of blast holes for all tests.

As shown in Fig. 1, the tests clearly demonstrated that a 12-hole, 160-lb. blast could be discharged with the same approximate vibratory effect as for blasts loaded in conformity to the city ordinance. The seismograms accompanying Fig. 1 refer to the rec-

(Continued on page 182)

DEVELOPMENTS IN GYPSUM MANUFACTURE

Medicine Lodge, Kan., plant of National Gypsum Co. Inset: Take-off end of the dryer in the wallboard plant

National Gypsum Co. plant at Medicine Lodge, Kan., represents latest practices

By WALTER B. LENHART

DURING THE PAST SEVERAL years the gypsum and gypsum wallboard industries have undergone a gradual, step-by-step development by financially independent organizations, any one of which could be used as an excellent illustration of increased production stemming from the free enterprise system. Each year has seen from one to several large capacity plants either rebuilt, or started from scratch. We could cite as illustrations of plants built in the past few years those of National Gypsum Co. (December, 1950, issue of ROCK PRODUCTS); Western Gypsum Co.'s plant at Sigurd, Utah; The Standard Gypsum Co., Long Beach, Calif., (now a part of Kaiser Gypsum); the work at Ft. Dodge, Iowa, by the Certain-Teed Products Corp.; and of the United States Gypsum Co. at many of its operations.

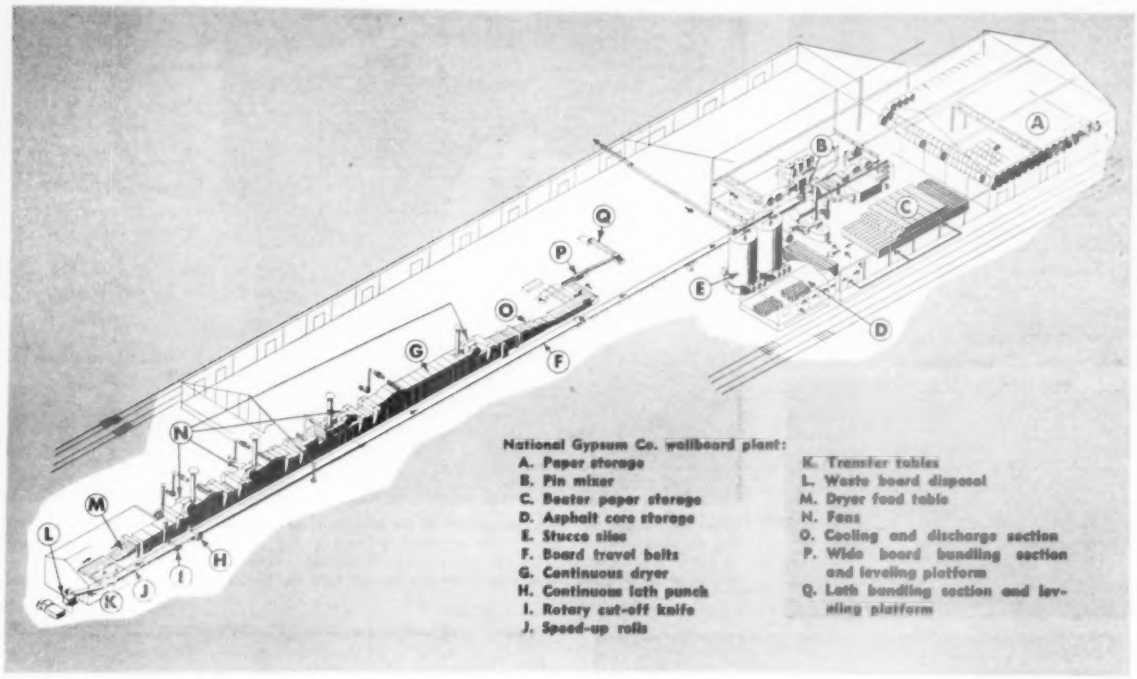
Gypsum is often referred to as "the mineral nobody knows," but its use reaches every corner of the construction industry. Sales of gypsum wallboard and gypsum lath alone run into millions of dollars monthly. Its use in wallboard, plasters, the portland cement industry, in the arts as a source of casting material, in dental work and literally scores of construction uses makes it an important rock products material.

Loading crude gypsum into shuttle cars at National Gypsum Co.'s underground mining operation at Sun City, Kan.

Crude gypsum ($CaSO_4 \cdot 2H_2O$) is found in New York and Michigan and almost every state west of the Mississippi. Canada and Mexico export large tonnages into the United States from deposits that are controlled for the most part by U. S. interests. Because of the growing shortage of elemental sulfur, used in making critically short sulfuric acid, gypsum may become still more useful as a source of sulfur dioxide or sulfur trioxide. According to some authorities, it would be possible to calcine gypsum (at high temperatures) along with silica and alumina to produce sulfur dioxide and sulfur trioxide. These two gases along with oxygen and water form sulfuric acid. Portland cement would conceivably be a by-product.

As the Western states have large reserves of gypsum, and some of these same states have immense fuel resources, the gypsum industry may be one reason for a westward shift of many basic chemical industries.

The art of calcining gypsum is an old one, and most operators use the kettle process. A few plants use rotary kilns but some of the rotary kiln plants built early in the century have been replaced by kettles. In either case it is not a complicated calcining process and throughout the world there is a similiarity of calcining techniques. Therefore it is not surprising to see kettles, mixers and sacking ma-


National Gypsum Co. wallboard plant:
A. Paper storage
B. Pin mixer
C. Beater paper storage
D. Asphalt core storage
E. Stucco silos
F. Board travel belts
G. Continuous dryer
H. Continuous lath punch
I. Rotary cut-off knife
J. Speed-up rolls
K. Transfer tables
L. Waste board disposal
M. Dryer feed table
N. Fans
O. Cooling and discharge section
P. Wide board bundling section and leveling platform
Q. Lath bundling section and leveling platform

chines exported to France, Mexico and other foreign countries because of this similarity in calcining knowledge and technique.

But when the art of manufacturing gypsum wallboard and gypsum lath was introduced in most of the calcining plants in the United States, the gypsum industry, from necessity, took a new turn. First it became more or less concentrated in large, financially sound organizations, for the cost of a modern gypsum wallboard plant runs into the $3,000,000-5,000,000 range. This means high capacity plants strategically located with reference to sources of supply, and to markets.

Second, there is no question but that United States manufacturers of gypsum wallboard (and gypsum lath) lead the world in technical skills and "know-how," and have available to them superior mechanical devices to carry out the manufacturing process. This know-how has resulted in our having the world's most economical manufacturing processes, and, in the opinion of many, the world's best gypsum wallboard products.

Because of the location of the larger markets for gypsum products and the geographical distribution of crude rock, imports into the United States of crude gypsum are important. Plants in New Hampshire, New York, Maryland and Georgia receive waterborne rock from Canada. On the West Coast gypsum is imported from San Marcos Island (Mexico).

Increases in freight rates have resulted in shifts, mostly westward, in the building of new wallboard facilities. Trucking has absorbed some of the transportation of finished materials to the markets and this trend unquestionably will grow.

One might get the idea that smaller production units built so as to serve a relatively small geographical area might become a possibility as a means of offsetting higher and higher freight rates, but because of inherent conditions (geographical location of crude materials) and higher installation and operating costs per unit of production, large and efficient plants will most likely dominate United States markets for many years to come. However, for foreign uses, the possibility of a relatively small capacity "packaged plant" that would be capable of turning out a superior product could be a challenge to the equipment industry.

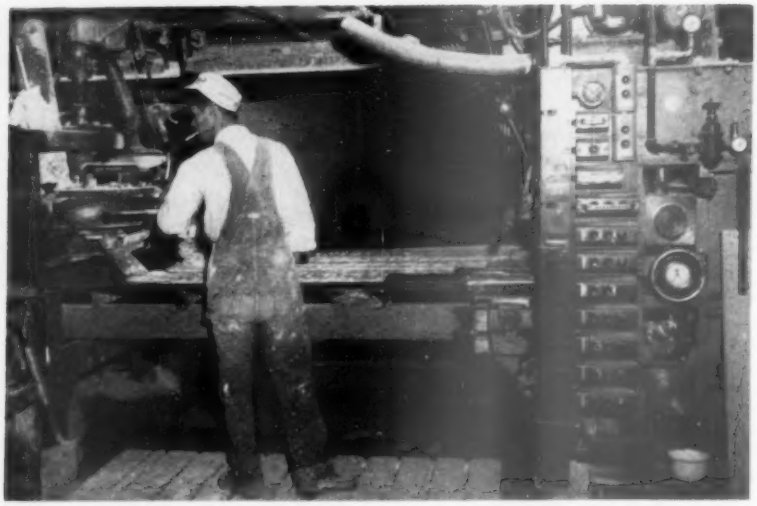
Newest Wallboard Plant

The newest wallboard plant to be built in the United States is National Gypsum Co.'s Medicine Lodge, Kan., operation. Medicine Lodge is in southwestern Kansas about 260 miles west of Kansas City. The name "Medicine Lodge" has a familiar ring to most gypsum producers for it is known around the world as the locale where Best Brothers, Keene's cement was manufactured. Best Brothers organization merged with National Gypsum in 1938.

Keene's cement is a dead-burned gypsum to which an accelerator, such as alum, has been added to promote setting. The general techniques involved in its manufacture are fairly well known and in the past many companies attempted to compete with Medicine Lodge. Most of these attempts failed because of impurities in the crude gypsum, which at high temperatures cause discolorations of the final product. The crude gypsum mined near Medicine Lodge is of such purity that when calcined it remains snow white. Furthermore it has inherent properties of controlled setting time, high density, high strength and hardness. It is shipped, usually in paper bags, all over the United States and to foreign countries. Other manufacturers of gypsum products are among National Gypsum Co.'s best customers of Keene's cement.

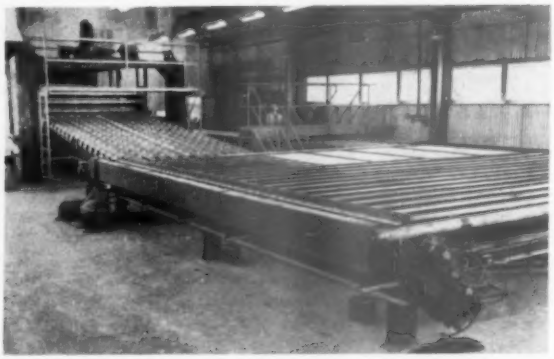
Keene's cement is used in the arts for casting art objects and interior building trim. The chances are that

Partial view of the dryer in the new wallboard plant of National Gypsum Co. The operator is near one of the four temperature control stations



Upper left: Unloading mine-run gypsum at the primary crusher at the Sun City, Kan., mine. Left: The gas supply to each zone (there are four) of the gas fired, eight-deck wallboard dryer is controlled from this station; a blower is in the left foreground. Above: The mixer (left) deposits gypsum paste or pulp on paper that forms the bottom face of the wallboard. Controls are at right

Left: View of paper storage room with electric hoist to facilitate movement of the paper rolls



Above: Transfer table and elevator (the sloped section) that feeds green wallboard to the dryer

Above: Intermediate screening of the raw rock prior to fine grinding is handled on vibrating screens

Left: "Gold Bond" wallboard is stored on pallets in the warehouse

most of the decorative work in your local theatre (ornamental figurines, statuettes, etc.) were cast from rock mined in western Kansas. Castings made from Best Brothers Keene's cement can take a high polish and only an expert could tell it from finished marble.

Because of the westward shift of population and industry, National Gypsum Co. saw the need to serve the area more completely so on July 3, 1951, the new wallboard plant went into operation. It is the farthest west operation of National Gypsum Co., whose trade name "Gold Bond" is well known in the East.

Crude gypsum for the Medicine Lodge plant is secured from underground mining operations at Sun City, Kan., 26 miles west of Medicine Lodge. The rock is mined from flat veins; mined rock is delivered to the crushing plant via a tunnel. For primary loading a Joy loader is used in conjunction with Joy shuttles. D. C. Chads, plant manager for National at Medicine Lodge, was one of the pioneers in the mechanization of underground gypsum mining. The rock is given two crushings at the mine, after which it is hauled to the Medicine Lodge calcining plant over the Santa Fe railroad.

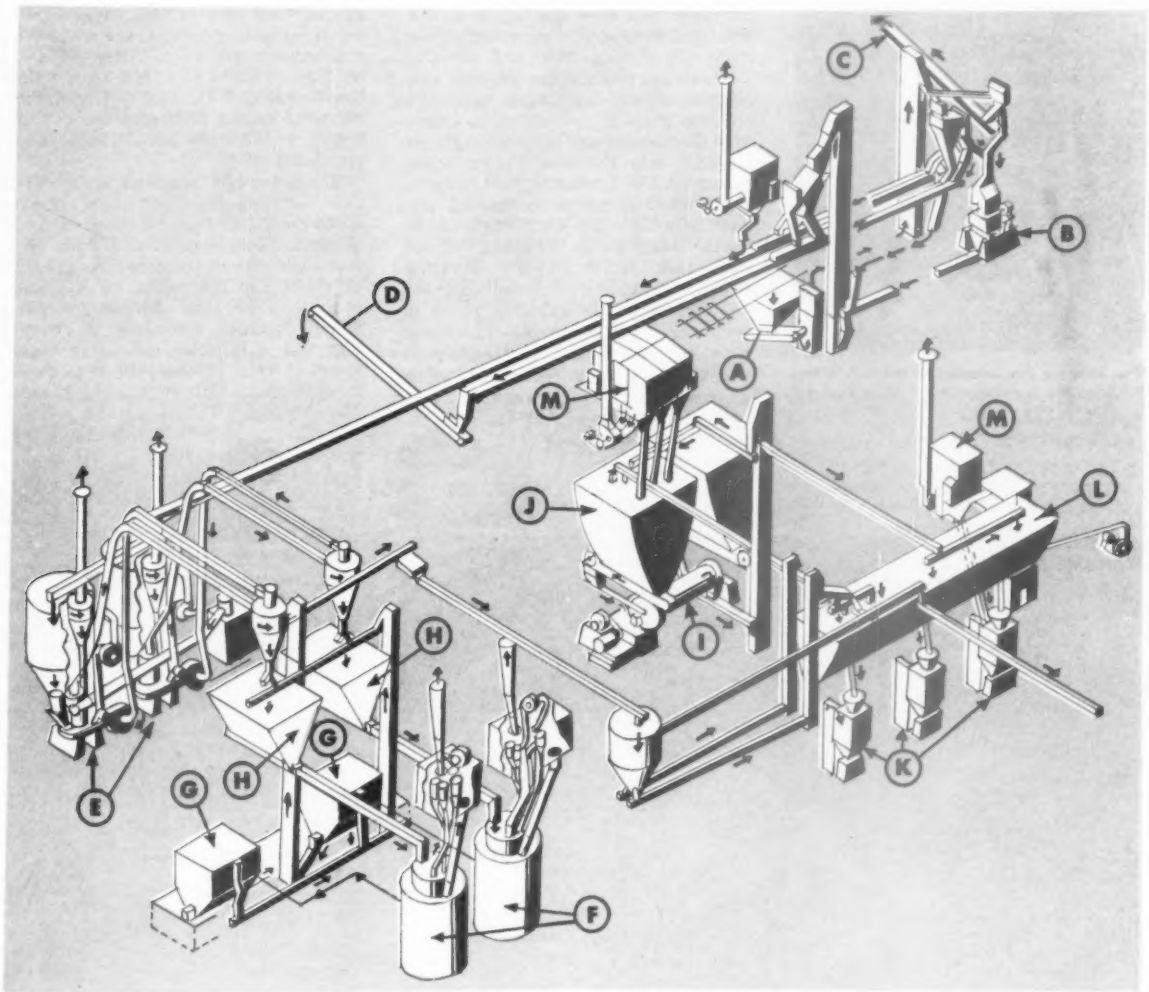
The flow of material at Medicine Lodge up to the point of wallboard manufacture is the result of many years of experience. Any great differences would probably stem from the Keene's cement manufacturing section. Here three gas-fired rotary kilns do the calcining.

For the calcining of stucco (for ultimate use in the manufacture of hardwall plaster, finishing plaster, and for wallboard uses) two 16-ton capacity Ehrsam kettles are in use. A third kettle was being installed at the time of inspection. The kettles are gas-fired by means of three Maxon "Premix" burners per kettle.

The kettles use conventional pressed steel bottoms and rabble mechanisms. Dust from the kettles is prevented from escaping by the use of Raymond dust collectors.

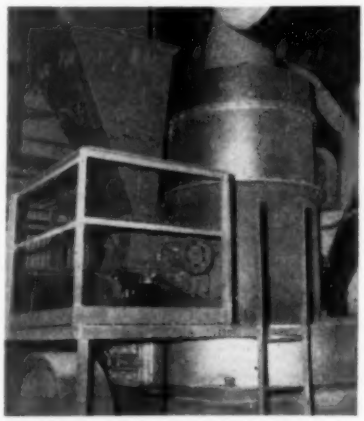
As will be seen from the isometric drawing of the plant the flow of material is rather complicated and only its general features are described here.

Because of the large number of products made at Medicine Lodge, the raw grinding ahead of the kettles is a little unique, and is more or less of a tailored product. There are three, (two at time of inspection) high-side Raymond mills (No. 5048) and each mill is equipped with double whizzer separators. The whizzers have variable speed drives so any desired fineness can be obtained by



Kettle plant equipment (keyed to drawing above) includes: (A) crude rock receiving hopper and conveyor, (B) hammermill, (C) outside rock storage, (D) enclosed rock storage, (E) roll-type mills, (F) calcining kettles, (G) hot pits, (H) kettle feed bins, (I) tube mill, (J) stucco bins, (K) packing machines, (L) gauging, molding and cement plaster bins, and (M) dust collectors

Left: Checking the dimensions of the three parallel strips of plaster board coming from the master forming rolls is only one phase of quality control practiced at the plant. Right: Take-off end of the eight-deck, gas-fired dryer. From here boards go to the bundling machine



The mills for fine grinding of the rock before calcining are provided with hot air so that wet rock can be dried as it is ground

changing the speed of the fan.

The cyclones are 8 ft. diameter and equipped with double-type discharge valves. The exhauster fans are RF-24's and on the vents are RF-18 exhausters. The return air from the cyclones goes to a 6-ft. 6-in. concentrator-collector before venting. A single, gas-fired flash dryer serves all three mills.

There are two storage piles for raw crushed stone, one inside and one outside. Prior to stockpiling in either pile the mine rock is given a third crushing with a T-4-30 Pennsylvania nonreversible hammermill. Link-Belt elevators and screw conveyors are used to a high degree throughout the plant. Intermediate screening of the raw rock is on Tyler vibrating screens with Raymond mills accomplishing the finer grinding prior to calcining. The Raymond mills are provided with hot air from a gas-fired furnace so that wet rock can be dried as ground. Cylindrical steel bins with cone-shaped bottoms, of 125-tons capacity each, are ahead of the grinding mills. Sly dust collectors are used throughout the plant for dust removal from other than kettles.

The new wallboard plant has ample storage facilities for paper and for the finished materials. The buildings are of steel and reinforced concrete construction throughout; the walls are corrugated sheet steel. The wallboard building is 836 x 200 ft. with a wallboard belt 560 ft. long between the master forming rolls and the cut-off knife. An Ehrsam cut-off knife and punch are used.

The dryer is a gas-fired, eight-deck Coe unit equipped with conventional speed-up rolls, transfer section and elevator. The Coe dryer is divided into four heater zones, temperatures in each of which are controlled by Xactline controls. Each zone also has its individual Foxboro recording thermometer and a Wheelco indicating thermometer. Minneapolis-Honeywell Protectoglo combustion safeguards are also featured.

On the unloading end of the dryer are the bundling machines for board and lath. Each type of product is stacked on a "levelator" similar to those used in the Buffalo, N. Y., plant (described in detail in the December, 1950, issue of ROCK PRODUCTS). The fleet of lift trucks for handling the palletized boards include Elwell-Parker and Automatic units.

The plant was designed by the engineering staff of National Gypsum Co. Ditmars, Dickman and Pikens of Oklahoma City, Okla., had the primary construction contract.

In the plaster shipping section of the older plant are three Ehrsam mixers and three-tube St. Regis packers.

Gypsum plaster being packed for shipment

Personnel

D. C. Chads is plant manager and S. J. Shepler, mine superintendent. H. F. Plemmons is board plant superintendent and E. A. Melkus, plant superintendent; Melvin Soldol, plant engineer; R. D. Warren, personnel and safety; Marion Witkowski, quality control supervisor and L. F. Gilmore, office manager.

RECORDING DUST COLLECTOR PERFORMANCE

Combination analyzer and recorder provides continuous record as evidence of precipitator efficiency

By WARREN WALKER, JR.*

THOSE SECTIONS of the rock products industries which handle only wet materials, such as wet concentration, washing, and part of wet process cement plants, are ordinarily free of major dust problems. But as soon as dry materials are introduced, it is inevitable that dust will be produced, either from the natural fine material —from abrasion of the substance on itself—or dust introduced by crushing and grinding. Some processes produce dust additionally by chemical and physical changes brought about in processing, such as hydration and calcining.

Regardless of its origin, dust in a plant has many deleterious results. Among these are: (1) loss of valuable product, (2) excessive wear and tear on plant equipment such as gears, bearings, shaft and belts, (3) physical and mental effects on plant personnel, and (4) the effect on the surrounding vicinity, which may vary from adverse public opinion to actual damage to crops in the country or to industrial and personal effects in built-up areas.

Many communities have recently taken cognizance of the physical damage and impaired morale caused by air pollution and have passed ordinances, some quite stringent, to force control. Some plants have taken steps themselves, motivated by a new sense of public responsibility and community spirit, and in some cases by a realization that the great bulk of the dust being lost constituted their own valuable products. In these latter instances, it has often been found that the value of the recovered product rapidly paid for the expenditure on collecting equipment, and at the same time improved community relations.

Equipment for collecting dust is available in many types: (1) water devices, (2) centrifugal, (3) electrical, (4) velocity reducing, (5) fabric, and (6) combinations of the above five. All types are in use in various sizes, the type used being dependent on the size and consistency of the particles, the concentration of dust in the unfiltered air and the required purity of the filtered air. Regardless of the type collector in use, a record of its efficiency and an assurance of its continuing operation are very valuable. A device, known as the General Power Plant Dust Recorder is available for constantly monitoring the amount of dust in the filtered air leaving the precipitators or collectors, and for signaling plant personnel when the amount exceeds a preset limit. This equipment is manufactured and sold by General Power Plant Corp., New York, N. Y.

The equipment consists of an analyzer, which should be located as close as possible to the place from which the sample is taken, and a recorder, which may be located at any convenient point in the plant, such as near the dust collector controls, or in a central control room.

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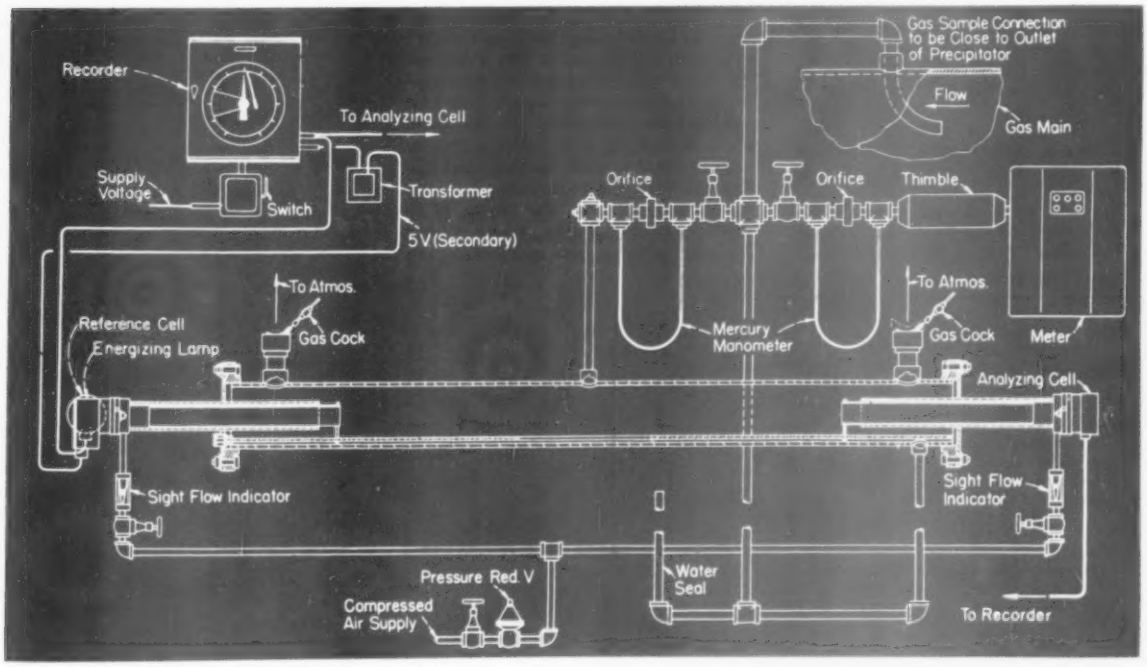
Fig. 1: Diagram of dust analyzer; dust laden gases are drawn through the sampling tube in the center, and the amount of dust present is "read" by the reference and analyzing photoelectric cells



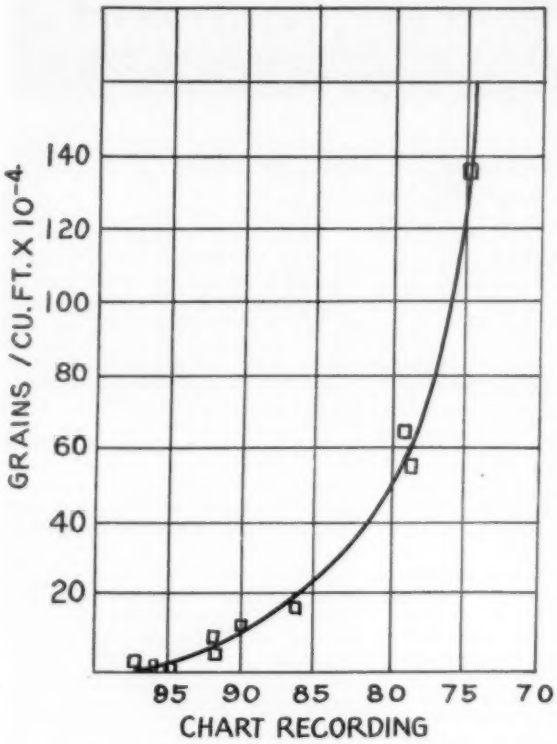


Fig. 2: Typical calibration curve (blast furnace gas analyzer)

Description of the Analyzer

The analyzer (Fig. 1) is the photoelectric type. It includes two photoelectric cells mounted in opposite ends of a sampling tube. One, the *reference cell*, receives its excitation directly from the light source lamp, while the other, the *analyzing cell*, receives its excitation from the same light passing through the gas being analyzed. The gas sample is introduced into the center of the main tube and flows both ways, between the energizing lamp and the analyzing cell, to the exhausts where it is discharged (and burned if flammable).

The velocity of the gas through the sampling tube is unimportant except to the extent that it must move fast enough to keep the dust in suspension and to keep the sample representative of the gas in the main at the time of analysis. For this reason, the sampling tube should be located adjacent to the point where the sample is removed from the main. The pressure in the sampling tube must be constant.

The outlets are large in relation to the inlet because of the necessity of keeping a constant pressure in the sampling tube; the use of large exhausts keeps the sampling tube at practically atmospheric pressure. In the event the gas being sampled is not under pressure in the main flow line, aspirators are used to maintain a representative flow. A manometer measures the differential across an orifice as a means of indicating that a proper flow of gas is being introduced into the sampling tube.

The entire assembly is gas tight, as some gases which may be analyzed may be poisonous, inflammable or otherwise objectionable. The lenses on the lamp and cell must be protected from any accumulation of dust and moisture in the event that the sample is saturated. A 20-in. long, 2½-in. tube in front of both the lamp and the cell provides dead air zones to keep the gas away from the lenses. It is recommended that a small quantity of dry air be introduced near the lamp and cell to keep the dust and wet gas out of these tubes. This air doubles back along the outside of these tubes to the outlets without changing the length of the sampling zone between the ends of these 2½-in. tubes. Sight flow indicators are installed to aid in regulating this flow and to enable the operator to insure that it remains flowing. A water seal is provided to take care of moisture condensation in the event of saturated gas.

To measure very dirty gas, it is necessary to reduce the length of the sampling zone in order to keep the reading within the instrument's range. This is accomplished by sliding the inside sleeves out of the 2½-in. lamp and cell support tubes. In this manner, the length of the sampling zone can be varied between 60 and 20 in.

Recording Dust Content

The two photoelectric cells are connected so their outputs oppose—the Brown ElectroniK potentiometer used here then sees only the difference e.m.f.—thus eliminating errors due to energizing lamp output changes resulting from variations in line voltage. The instrument is zeroed by adjusting the circuit so that the outputs of the two cells are equal when the sampling tube is filled with clean air.

The equipment is designed so that the collimated light reaching the analyzing cell is greater than that at the reference cell when the lamp is at the focal point of the lens. The two cells are brought into balance by moving the lamp ahead of the focus point, thereby scattering the light on the analyzing cell. This is accomplished by an adjusting screw accessible through the back of the energizing lamp case. In this way, the instrument can be compensated for any dust that might have collected on the lenses. Several months of operation indicate that this is rarely necessary.

Calibration of the Recorder

The recorder must be calibrated for each type of gas and for each setting of the sampling tube, i.e., the length of the sample. The length of

Fig. 3: Dust analyzer schematic circuit diagram

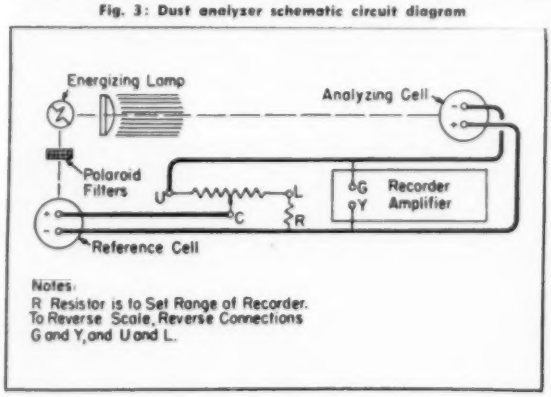
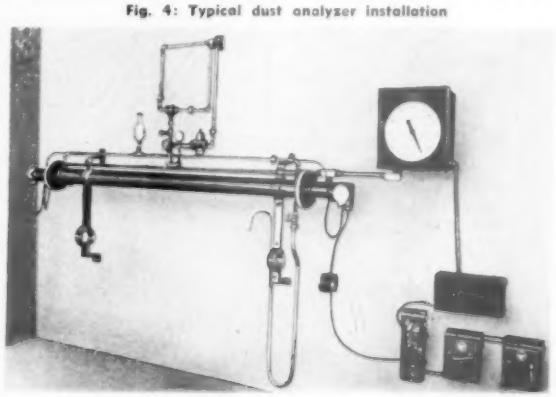
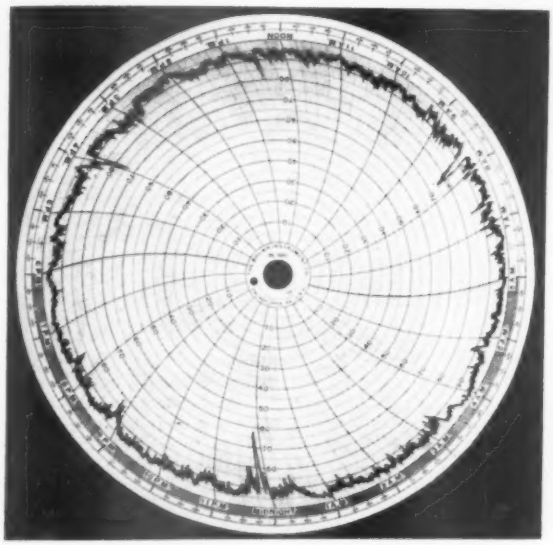


Fig. 4: Typical dust analyzer installation





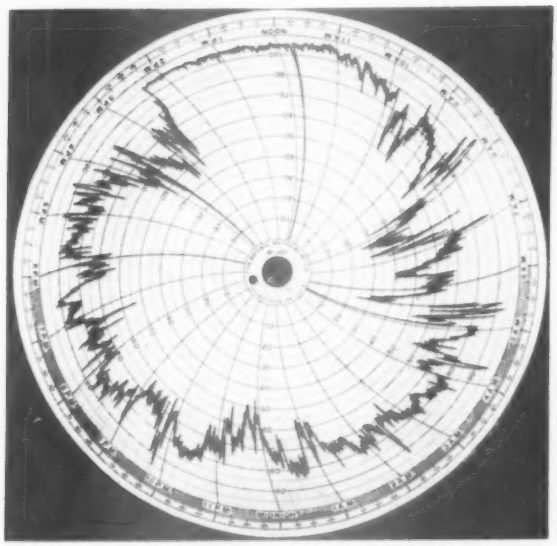


Fig. 5 (left): Chart record showing proper operation of precipitators. In this installation, the gas has an average concentration of 0.0006 grain/cu. ft. The dips at 8 a.m., 4 p.m. and 12 midnight are caused by cleaning the dust collectors. Fig. 6 (right): Typical chart record showing trouble with gas cleaning equipment. From 5 a.m. when chart was changed until 10 a.m. when the condition was partially corrected, the cleaning equipment was not removing sufficient dust from the gas. At 11 a.m. the condition was completely rectified and continued good until 2:30 p.m. when further trouble developed. The deep break at 11:45 a.m. was caused by temporary power failure to the gas cleaning equipment

the sample is altered depending on the average density of the gas to make the pen record nearer the outer edge of the chart. For relatively clean gas, this length is 60 in.; for very dirty gas it may be 20 in.

Calibration is accomplished by measuring the actual solid content of the gas, using the familiar thimble and weighing the contents. The start and finish of this test is noted on the recorder chart with the number of the thimble. The actual weight of solids is then compared with the average chart reading.

These results are plotted on a graph —chart readings versus weight of solids—and a smooth curve is drawn through the points. A typical calibration curve is shown in Fig. 2. In this case, the width of the sample was 60 in. It will be noted that this sample width is suitable for densities up to 0.012 grain per cu. ft. of gas at atmospheric pressure.

The ElectroniK recorder is provided with a 12-in. chart calibrated 0-100, and has a 24-hr. rotation. It operates on 115-volt, 50-60 or 25-cycle current, and is not affected by line voltage variations of plus or minus 10 percent. A switch is provided to actuate an alarm when the dust concentrations exceed a preset limit. The sensitivity, or amount of pen deflection for a given change in dust concentration, can be varied by changing resistance R.

Chart Records Precipitator Operation

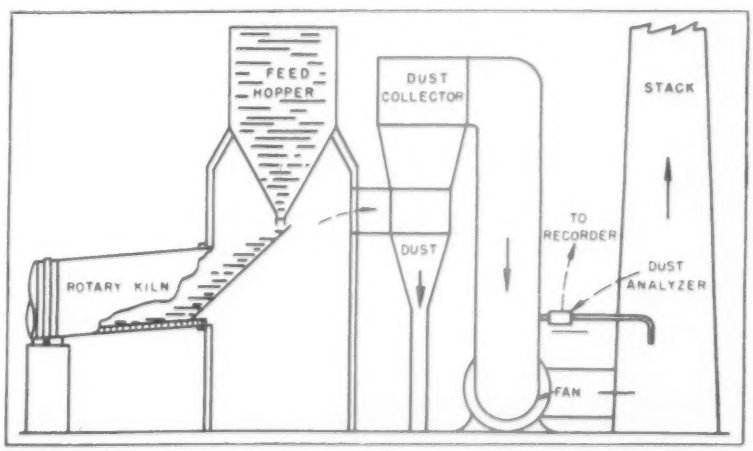
Fig. 5 and 6 are reproductions of two charts showing typical records. Fig. 5 shows a normal record with the precipitators operating to reduce the dust concentration to the required 0.0006 grain per cu. ft. Fig. 6 shows a record where operation of the precipitators was faulty during the major portion of the day.

The best location for the sampling tube is dependent on where, in the process, it is desirable to measure dust concentration. To check the operation of precipitators or collectors, sampling should be conducted in the straightest lead of duct, piping, or stack available on the discharge side. The longer the lead of straight duct available, the easier it is to obtain a continuous representative sample. Turbulence and eddies introduced by restrictions and angles are reduced to a minimum.

In most locations in a cement mill, there is sufficient velocity of the gases to maintain dust in suspension without resorting to aspiration. When sampling stack gases from the kiln, a form of natural aspiration is available, as shown in Fig. 7, by discharging the sample back into the kiln exhaust on the low pressure side of the induced draft fan, rather than to the atmosphere. This insures a continuous flow of gases through the sampling tube.

The sample connection should protrude into the stack approximately one-third of the stack diameter for the most representative sample. Design of the entrance to the sampling line should be as shown in Fig. 8, so as to reduce eddy currents and turbulence in front which would tend to make the

Fig. 7: One method of installation for forced aspiration; pressure drop across the fan insures good continuous sample



sample less representative.

Temperature of the gases discharged from a dry process rotary kiln is quite high, in the vicinity of 1600-1700 deg. F. Waste heat boilers, when used, reduce the temperature of the gases materially. If necessary, tempering air is added before the gases reach the induction fan to bring the temperatures below the fan's rated temperature limit, or about 600 to 700 deg. F.

Sampling may be done at any of several different places, such as prior to entering the waste heat boiler, or in the stack. The temperature of the gas sample must be cooled to approximately 120 deg. F. before it enters the sampling tube. This is done in two ways: (1) radiating fins are attached to the sampling line to reduce the temperature before it enters the sampling tube, and (2) cooling coils are wrapped around and brazed to the stationary end pieces which contain the reference and analyzing cells and their energizing lamp. Water circulated through these tubes provides adequate protection for the vulnerable parts of the analyzer. In addition, the small quantity of clean dry air introduced into these tubes to prevent fogging and moisture on the lenses also prevents the hot gases from entering the tube.

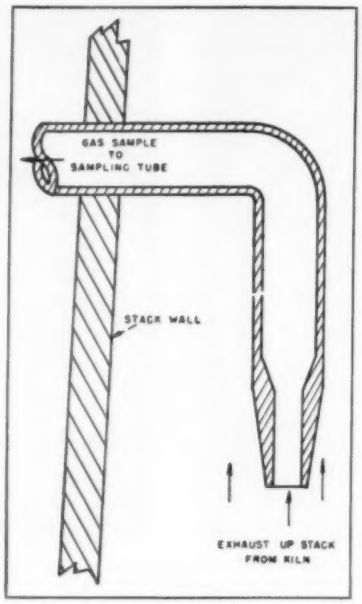


Fig. 8: Sampling connection installed in stack

Where the sampling tube is installed outdoors, as is required for exposed stacks, the only protection required from the weather is a small roof or shed to prevent ice, snow and rain from falling on it. A length of resistance winding wrapped around the water seal piping, and sometimes around the tube itself, covered with insulation and energized, suffices to prevent freezing in the event the gases are not hot enough to warm these sections.

The records provided by this equipment are invaluable proof of the efficiency of dust collection. Operating personnel have a definite guide, showing them when to clean bags or precipitators and a positive alarm indicates failure of collecting equipment. Management has a record of product lost, and a record to show air pollution enforcement officers or community representatives checking on dust from the plant. Claims for damages may be averted when adequate records are maintained.

Taft-Hartley Act Amended

THE FIRST AMENDMENT to the Taft-Hartley Act, since it became law in 1947, was recently passed by Congress and signed by the President. The bill, S.1959, eliminates the requirement for holding union-shop authorization elections and validates lawful union-shop contracts previously entered into as well as any legal action taken pursuant to such contracts. V. P. Ahearn, as executive secretary for the National Sand and Gravel Association, the National Industrial Sand Association and the National Ready Mixed Concrete Association, has interpreted the provisions of the act for industry members. It is, in part, as follows:

The bill, S.1959, imposes two conditions upon the execution of valid union-shop agreements. It requires:

(1) that the labor organization involved be a representative of the majority of the employes in a bargaining unit, and

(2) that the labor organization has received from the National Labor Relations Board notice of its compliance with the reporting and non-Communist affidavit requirements of the Taft-Hartley Act.

The provisions of the act relative to union-shop agreements have not been changed. Whether to enter into a union-shop agreement with the certified or recognized bargaining representative remains a bargainable issue for employers. An employer may agree through collective bargaining to include such union-security provisions in his contract, but he is not required to do so.

The new law makes no change in statutory requirements that union-shop agreements may not require union membership until 30 days following the beginning of employment or effective date of the agreements, whichever is later. Union-security agreements providing for more stringent union membership requirements are still unlawful. Neither is there any relaxation against the outright ban on closed-shop agreements or the power of the states to prohibit any compulsory union membership agreements.

The Taft-Hartley Act continues to safeguard employes in their right to get rid of union-shop agreements which a majority of employes disapprove. N.L.R.B. is authorized to conduct elections on the petition of 30 percent or more of the employes in a bargaining unit to determine whether the union's authority to enter into a union-shop arrangement should be rescinded.

The new law adds a new Section 18 to provide retroactive protection to parties who had entered into the union-shop agreements in reliance upon certifications issued by N.L.R.B. This was necessary because of the Supreme Court decision in the Highland Park case, holding that the top C.I.O. and A.F.L. officials were subject to the non-Communist affidavit section of the Taft-Hartley Act. This decision had the effect of invalidating representation and union-shop authorization certificates issued by N.L.R.B. prior to the dates those officials complied with the filing requirements of the act. The new section validates certificates and other past actions of N.L.R.B. taken prior to the Highland Park decision.

Gypsum Products Report

NEW SECOND-QUARTER (1951) records were set in the production of crude gypsum and in most of the categories of gypsum, a report of *Mineral Industry Surveys*, Bureau of Mines, states. Domestic mine output of 2,305,307 short tons was 20 percent higher than in the same period of 1950. The total apparent supply of crude gypsum reached a new high of 2,969,716 short tons, though imports of crude were down slightly. Records were also set in every major classification of gypsum and gypsum products. Calcined gypsum production was 12 percent higher than in the second quarter of 1950, and the output of cement retarder and base-coat plaster were 9 and 1 percent higher, respectively, than in the preceding year. Gypsum board production was 17 percent higher than in the same period of 1950.

Rock Wool Backing

PHILIP CAREY MANUFACTURING CO. Cincinnati, Ohio, was recently issued a patent to manufacture a new fire-resistant backing for rock-wool batts. The new product, called Fire Guard Vapor Barrier, is claimed to stop as much heat as a 5-ft. brick wall when it is used with 3 in. of rock wool. It bars the passage of warm, moisture-laden air through walls, thus preventing damage to structural members through condensation.

Acme Materials Co., Tulsa, Okla., has a Cedarapids portable plant consisting of a jaw primary crusher, hammermill secondary, and triple-deck sizing screen

PORTABLE PLANTS' ROLE IN AGGREGATES PRODUCTION

By WALTER B. LENHART

WHEN THE SUBJECT of portable plants is discussed one usually has in mind rubber-mounted rock processing equipment that can be moved over the highways to any desired location. One used to picture a single unit capable of turning out crushed and sized aggregates, but the trend has been more and more towards sectionalizing the various units so that actually any rubber-mounted piece of equipment could be a part of a portable set-up. These parts range from compressors, wagon drills and lift trucks to shovels and other bulky pieces.

To review what was new during 1951 in portable plants involves a considerable amount of detail which revolves about the various claims of the manufacturers — sounder basic construction, better and/or larger crushers, better wear-resisting steel, higher capacities, anti-friction bearings, lubrication improvements, more efficient vibrating screens, and innumerable other design factors. The manufacturers of portable plants are aggressive salesmen and no doubt to most readers their various claims have been hammered home long before now, so our intent here is first to grant readily that great progress has been made in portable plant details. Secondly, it is our belief that a portable plant can be as much a part of an established producer's plant set-up as his portable shovel and other mounted items. Once a portable moves into any active construction area it is apt to stay there as a competitor; thus if a producer wishes to retain certain market areas this newer tool should be considered seriously.

The importance of the portable-type plant to the established commercial producer is becoming increasingly apparent, due in part to increasing freight rates and to the evolvement of high capacity plants, sectionalized so that a high degree of flexibility is possible. Portable plants with two and sometimes three crushing units, scrubbing facilities and with intermediate screening are available so that a large number of dry or washed sizes of stone can be produced.

The bottom deck feed idea used by Pioneering Engineering Works, Inc., has been a method that has resulted in greater screening capacity with less wear on crusher jaws and other wearing parts. Another feature of the Pioneer portable is the ease and rapidity with which crusher settings can be changed without stopping the crusher.

This Pioneer plant of Tucson Sand and Gravel Co., Tucson, Ariz., is used to operate in many remote locations in the production of aggregates

Universal Engineering Corp. has developed the so-called TwinDual method, the name of which is derived from the TwinDual roll crusher. This crusher consists of two sets of different diameter rolls mounted side by side on common shafts. Both sets operate simultaneously. This provides the approximate capacities of two separate roll crushers, according to the manufacturer, yet saves space and weight required by two units. One set of shafts, gears and accessories in one frame requires less power. When combined with a jaw crusher primary and gyrating screen, the TwinDual roll crusher makes possible a compact high capacity three-stage plant.

One of the major problems of the manufacturer of portable equipment relates to their transportation over highways. This is being solved by adding more axles, elongating units to distribute the weight over a greater area of the highway, more and larger tires, and splitting up into more units.

Portable plants are only limited in size by highway load restrictions, for there are primary crushing plants which could be called portable as they are moved about in the pit, with crushers as large as 36 x 48 in. At Rifle, Colo., the U. S. Bureau of Mines is using a portable compressor that delivers 1540 c.f.m. It is rubber-mounted and is probably one of the largest portable compressors in use.

Other plants are so sectionalized that four and even five units are integrated to make up the processing plant. The tandem plant as exemplified by those of Iowa Manufacturing Co. is probably the most common type in use today. The basis of such a plant is a jaw crusher followed by reduction crushers with screens as required. The plants are rubber-mounted although flat-faced steel wheels can be used. Air brakes are often supplied to the rear wheels with control from the cab of the haulage unit. Such plants are often encountered where a large capacity jaw crusher is permanently placed at the head of the

Flexibility of the modern portable plant is demonstrated by this operation of B. L. Anderson, Garrison, Iowa, which produces agricultural limestone and three separate coarse aggregate sizes. The plant consists of a portable primary, scalping unit with horizontal screen, a hammermill secondary and four portable bins, and has a capacity of 210 t.p.h. of all material

line. This can permit economic use of such a tandem for quarry operations.

In some instances in the past local associations have attempted to block the use of portables in certain areas, but such efforts have not been very successful as far as the producers are concerned. However, this undoubtedly has been a factor in helping to prevent state highway departments themselves from having their own portables. However, the state of Maine has portable equipment, as does the city of Los Angeles at the so-called "Gorge" development in Inyo county on the Owens river, where two portable set-ups are operated by city employes. This is a power development project in a relatively light population area. One of the plants was a Universal portable.

The construction of turnpikes or thruways has stimulated the use of portables to a high degree. The Maine turnpike used several sets of portables, and the New Jersey turnpike is similar in this respect. As turnpike authorities are active in most of the more thickly populated areas the trend to use more portables will probably receive added impetus. We have records, mostly older published data, where several different companies in the Midwest, especially, have five or more portable plants and some of these same types of multi-plant producers have portable units sandwiched into their established plants.

In the Northwest where road jobs are scattered and remote from established plants a system has developed whereby the state highway departments certify pits of gravel, (or quarry sites) as being capable of producing acceptable materials. All bidders have access to these deposits. The practice then is for the successful bidder to move his portable plant to the certified pit that best suits his location needs. After the job is completed the portable is moved back home. Thus high capacities have been possible in remote areas.

Many of the larger dams completed in the United States during recent years have been built by combines of large operators. In each group will be found at least one organization that is primarily an aggregate producer. These producers have found that aggregate production for a concrete dam is as important as any other single part of the construction work. Several of the larger dams, (Ft. Gibson, for example) were built with aggregate prepared from portable plants. Other producers have used the same basic idea for supplying road jobs, airports, etc.

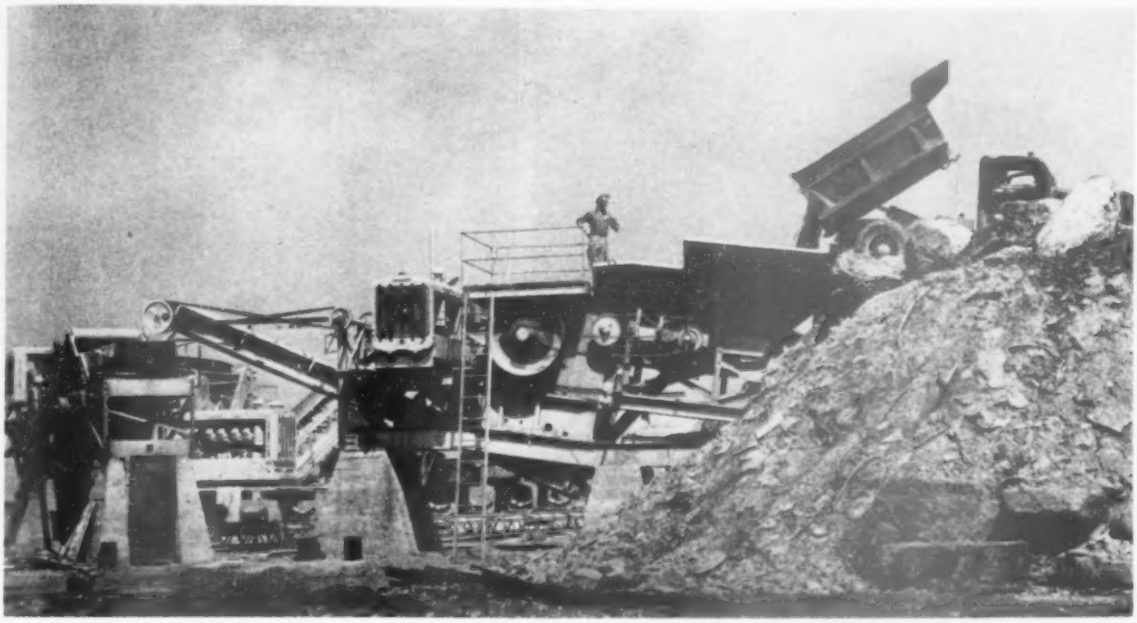
Portable plants find considerable use for production of traffic bound aggregates or so-called crusher-run. Several instances have been observed where such an installation was an adjunct to a stationary plant, giving the whole assembly higher capacity and greater flexibility (Pacific Coast Aggregates, Inc., Centerville, Calif.).

Modern highways require a heavy cushion or flexible base which often runs up to 2 ft. thick. Portable plants are playing an important role in supplying this large tonnage.

Portable plants are for the most part operated dry; however, a few are wet. The output from a wet portable if ground stored may easily become contaminated, especially in the western open sections, due to wind-borne dust. Such dust readily adheres to the washed and wet rock so that the cleaning almost becomes a useless operation.

The advantages of a portable plant are too obvious to discuss here at any length but some of the out-of-the-ordinary uses for portables, and instances of unusual designs, are given.

Left: Plants like the Pioneer aggregate plant shown here producing for a California highway project are capable of large tonnages. In this plant fine materials are immediately screened through a bottom screen deck. Right: A Universal TwinDual Master portable gravel plant is shown here, which gives three stages of crushing with two crushers



Worlock Stone Co., Canastota, N. Y., installed this Iowa portable primary crushing unit on a foundation as a semi-permanent operation

One established producer with price-cutting troubles was toying with the idea of buying a portable unit and moving it into the areas where prices were higher and which the price-cutter held as his territory. It was thus being used as a club to stabilize marketing conditions, for he said in effect, "Stop cutting prices or I will move in and really do a job of it in your most profitable territory."

Another established producer lost his plant by fire. To retain his markets he quickly moved in a portable plant which he ran successfully for quite some time. The producer then went ahead with plans to rebuild his stationary plant, which is now in production. The portable can now be used to give added production during a rush period, or can be used at more distant points.

One producer in the South installed a portable at his newly opened quarry. The feature that set this operation apart from the many portables we have seen throughout the country was the use of a small surge bin following the primary crusher. The bin was cylindrical and held about 100 tons, thus was easily portable. The surge bin was said to have evened out the flow of material through the plant and increased output.

If we attempt to look into the crystal ball and predict what is ahead in the portable field, we might find other uses cropping up. Some operators have soft stone troubles. However, by far the greater part of their production is sold to non-specification users. Where the state is the buyer it often becomes the practice to give the stone a special treatment (usually a soft stone eliminator of the impactor type) and such stone that is produced is stockpiled, then tested in the pile and shipped if acceptable.

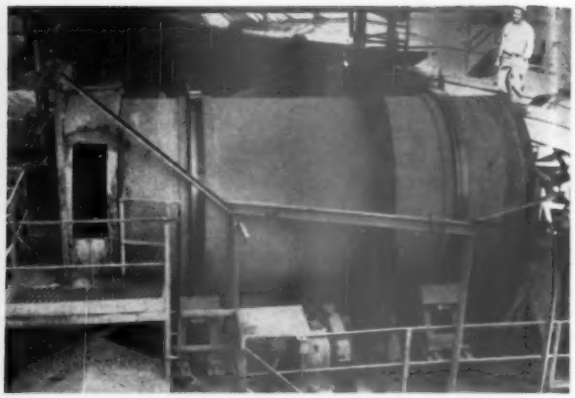
A recent development in portable crushing and screening plants is this Pioneer unit, designed specially for reworking depleted deposits which have a high percentage of large boulders

Another approach is to stockpile the material, test it, and if rejected move a portable impactor section to the pile and reprocess only that tonnage which is needed.

Portability in scrubbing equipment is not often stressed, but to use portable equipment to its highest capacity the equipment will probably have to adequately beneficiate materials that under conventional set-ups would be difficult. Clay adherents are chronic and rotary scrubbers are not always the answer. We ran into one novel proposal for the use of a portable washing plant (not in the rock products field) that points to a need; this operator proposed to use conventional rubber-mounted ready-mixed concrete haulage trucks by filling the drum of the mixer with his raw material along with some water, and as the truck hauled the material to his plant, the rock would be washed en-route. No doubt such manufactured scrubbers as the Huelsdonk washer could be made portable to a high degree. Elsewhere in this issue we have discussed this type of washer in the review of beneficiation of aggregates.

The advent of the heavy-media separation plant in the rock products field opens another possibility for a semi-portable unit. Already available

(Continued on page 199)



Left: Close-up of nodules as discharged from nodulizing drum. Right: Side view of main nodulizing drum, with discharge end on left and spare drum in background; man at upper right shows comparative size of the drums

Nodulizing Stack Dust for Kiln Feed

New process of Permanente Cement Co. corrects dust chemically in making nodules. Dust losses and costs reduced along with increased clinker production

By P. S. HASS*

IN THE EARLIER DAYS of operation the kiln dust collected in the Cottrell precipitator at the Permanente cement plant was, as a matter of practice, pug-milled with the kiln feed slurry and reintroduced to each of the four kilns. The practice of Permanente Cement Co. was little different from the procedures general to the wet-process cement industry.

This method of dust disposal had many disadvantages, which were intensified over the years by: (1) increasing the output of the kilns beyond rated capacity and (2) changes in the chemical balance of the mix. The principal problems inherent in this method were:

(1) The reduction of kiln feed solids, to accommodate the pugged-in dust,
(2) The resultant increase in fuel consumption,
(3) The high circulating loads in the dust handling and collecting equipment, due to the easy re-entrainment of the returned dust,
(4) The irregular effect on clinker composition,
(5) The non-uniform burning conditions due to varying dust loads, resulting in lost capacity and reduced brick life.

Process Development

Experimental work was initiated on a method of handling the collected dust separately from the balance of the kiln operation. The nodulizing properties of precipitated dust were investigated thoroughly, with and without clay additions to correct the dust chemically. Because of chemical differences between the dust and the mix from which it came (the dust contains more lime and less silica) it was known that dust could not be burned without excessive free lime and an "off-specification" clinker composition. Clay additions would be essential if the dust were to be concentrated in one burning operation. Typical analyses of the Permanente precipitator dust and clay, on the ignited basis, are:

	Dust, percent	Clay, percent
SiO_2	19.2	35.3
Fe_2O_3	2.1	25.8
Al_2O_3	2.9	29.5
CaO	70.9	6.3
Alkalies	2.5-3.0	—
Ignition loss	18-19	7-9

One of the leading cement equipment manufacturers was approached with the request to provide equipment suitable for the following alternatives:

(1) The calcining of clay-corrected dust alone, either nodulized or as a dry mix,
(2) The calcining of nodulized dust and slurry together,
(3) The introduction of nodulized dust into an existing kiln.

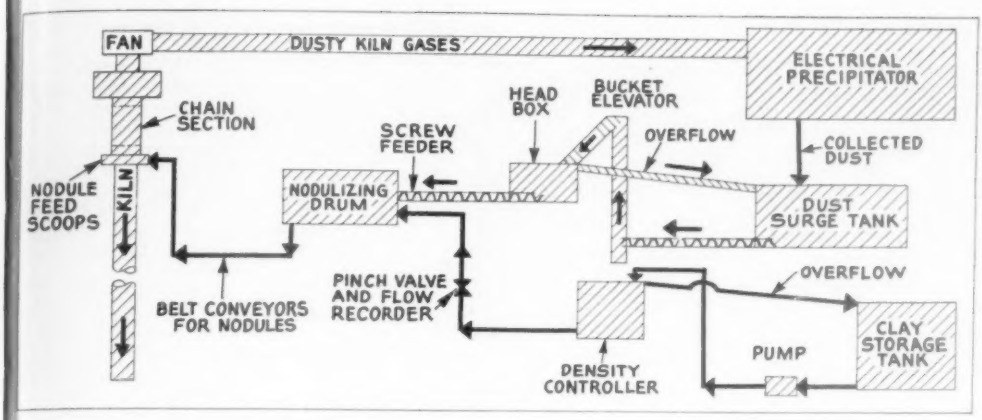
It was decided at Permanente to install a nodulizing drum and to introduce nodulized dust into one of the existing kilns by external feed scoops located just below the chain section. Experiments by the company had determined that: (1) it was entirely practical to nodulize the dust with clay slurry in one step instead of premixing dry clay and dust and then nodulizing with water, and (2) the nodules formed with clay slurry merely broke up into fractional pieces when introduced suddenly into high temperatures and did not pulverize or "explode" into dust of re-entrainment fineness.

The First Installation

The installment as first conceived consisted of an 8½-ft. dia. x 11½-ft. long. F. L. Smidth nodulizing drum; its nodule product was carried by slow speed belt conveyors to the feed scoops installed below the chain section of one of the four existing kilns. A dust surge tank was provided to receive collected dust and to feed the nodulizer via a half pitch, variable drive, close-tolerance, inclined screw feeder designed to prevent flushing. A clay storage tank, air agitated, discharged diluted clay to a pump which sprayed the slurry onto the dust in the nodulizer under pressure through special-alloy nozzles. The kiln feed scoops were three in number and contained openings into the kiln measuring approximately 1 ft. 6 in. square at the smallest point.

This installation handled about half of the collected dust, putting it all in one kiln where the dust nodules comprised about 25 percent of the total feed for that kiln. The balance of the feed entered as slurry in the usual manner. The three remaining kilns continued to receive pug-milled dust, but in reduced amounts in spite of an increase in kiln feed solids. The equipment was operated in this form for some time, with very real advantages in fuel consumption, production out-

*Assistant works manager, Permanente Cement Co., Permanente, Calif.



Flowsheet of the dust collecting and nodulizing apparatus; it is basically a very simple and straight-forward arrangement

put, uniformity of operations, reduced dust losses from the kiln that received nodules, etc.

Much was learned and accomplished during this "breaking-in" period:

(1) Chain sections of all kilns were shortened, to re-establish proper moisture content at the discharge ends of the chain systems;

(2) The proper nodule moisture content was established;

(3) The clay spray nozzles in the drum, which presented maintenance problems, were found to be unnecessary. The nodulizer was supplied with a separately-driven agitator shaft running longitudinally and equipped with beater rods for the first third of its length, rotating at higher r.p.m. in the opposite direction to the nodulizing drum. This agitator, originally supplied for controlling nodule size, proved to be an effective mixing device which obviated the need for an atomized clay spray for intimate mixing and easy chemical combination in the burning zone. Thus a perforated pipe, gravity fed and almost non-plugging, replaced the spray nozzles;

(4) Better controls were found necessary for metering the dust and the clay slurry to the nodulizer, to avoid variations in the kiln load and to obtain nodules of uniform moisture content. It also became apparent that the nodule feed should preferably be synchronized with the kiln drive, in the manner of slurry feeders.

Present Process

Plans were eventually initiated for a 25 percent expansion of the plant productive capacity. The dust nodulizing process had already proved itself to the extent that the fifth kiln was designed to handle the entire five-kiln dust load as nodules. A second kiln of the original four is also to be equipped with nodule scoops, which will permit two original kilns to handle the nodules when the new kiln is down; if the latter were to happen the entire pug mill set-up would have to be shut down at present.

The expanded facilities, including the enlarged dust nodulizing set-up, have been in operation for a considerable period. The accompanying flow diagram and photographs may be helpful in illustrating the process.

The dust recovered by the enlarged Cottrell precipitator is stored in a hoppered-bottom dust surge tank of 120 tons capacity. The tank is equipped for air agitation through ceramic pads, and a screw conveyor in the hopper bottom carries dust to a conventional bucket elevator. The latter discharges into a dust constant-head box, with a continual overflow back to the dust tank. Two open-top screw conveyors lie in the bottom of this head-box to feed two nodulizing drums. Inside the head-box, and for some distance after their emergence, these screws are of half-pitch, tightly enclosed construction, to prevent flushing. The screw feeders are driven by variable-speed drives which are synchronized with the alternator on the kiln motor drive shaft. The slurry feeder at the feed end is also synchronized with the alternator in the usual manner.

The nodulizing drums are: (1) the original 8½- x 11½-ft. drum, driven at 8 r.p.m. and equipped with agitator, scraper and clay pipe as before, and (2) a new better-proportioned, 8- x 17-ft. drum driven at 8.5 r.p.m. and equipped internally like the first drum. The smaller drum normally serves as a spare. Both drums thus operate at a peripheral speed of 213 f.p.m. and discharge their nodules onto a 48-in. belt conveyor traveling at 26 f.p.m. This belt transfers either to another 48-in. belt of similar speed which feeds the new kiln, or to a system of 36-in. belts to feed the scoop-equipped older kilns when the need arises.

The clay system consists of a 10-ft. dia. x 15-ft. high clay storage tank of approximately 7000 gal. capacity, equipped with constant air agitation. A rubber-lined pump services the special elevated tank containing a Foxboro density controller-recorder. This control tank, which continually overflows back to the storage tanks, delivers a slurry of predetermined and constant percent solids to the lines feeding the nodulizing drums. These

General view of nodulizing area with kilns in background. The two drums, bucket elevator and dust collection ducts are visible above

Belt conveyor discharging nodules to short drag conveyor, which in turn discharges nodules into kiln feed-scoops

clay lines have manually-controlled valves to vary the volume, but contain flow nozzles and flow recorders to provide a record of the gallons of slurry used.

The kiln itself is a 12- x 450-ft. F. L. Smidth kiln presently designed to handle a feed-load varying from 90 percent nodules, 10 percent slurry, to 25 percent nodules, 75 percent slurry. Below its short chain system, the kiln is equipped with a nodule scoop feeder consisting of six scoops, each having a 1 ft. 9 in. x 1 ft. 5½ in. open area. The internal scoop castings are of heat-resistant cast steel.

A dust collecting system utilizes the draft from the inlet side of the new induced draft fan to pull dust from the nodulizer discharge hoods and from the scoop feeder housing. Since this dust is carried in steam, special gas-burners with boiler-type controls at the points of dust origin add heat to maintain the internal temperatures in the ducts above the dew points until the gases are safely merged with the hot kiln gases at the fan and passed to the Cottrell.

This dust nodulizing installation was designed to handle up to 1000 tons of dust per 24 hr. day, with both nodulizers operating at capacity. Data on the operation as presently carried out may be of interest:

(1) The nodules average about 1 in. in diameter, and are reasonably hard by the time they reach the kiln scoops;

(2) The moisture content of the nodules is held at 18 percent plus or minus 1 percent. Additional water is included to satisfy the chemical needs of the partially-calcined dust;

(3) The percent of clay addition may be varied to suit the mix requirements, but normally runs about 3-5 percent clay based on dry weight of dust. It is supplied as a thin slurry of 12-16 percent solids. The clay originates in the kiln-feed blending system and is pumped to the storage tank at 30 to 40 percent solids and 90 percent minus 200 mesh;

(4) The kiln gas temperature at the point of nodule addition is 1200-1300 deg. F.;

(5) The new kiln at present is fed approximately 50 percent nodules and 50 percent slurry, giving an average kiln-feed solids to this kiln of 73-74 percent.

Benefits of Process

As compared with conditions existing prior to the installation of the first nodulizer, the following advantages can be definitely established for the dust-nodulizing innovation, and patent protection is being sought on this process:

(1) The kiln-feed percent solids on the four kilns receiving no dust has been raised 4 percent—from 61 to 65 percent solids—with an average of 73 percent on the new kiln receiving nodulized dust;

(2) Fuel consumption per barrel has been reduced about 6½ percent on the over-all five-kiln basis;

(3) The increase in clinker capacity from the addition of the fifth kiln has been 10-11 percent greater than could have been expected without the dust nodulizing process. In other words, the new kiln plus the process changes have added approximately 28 percent more capacity instead of 25 percent, furnishing a 3 percent "bonus" to the over-all capacity with only six months' experience;

(4) The amount of dust collected and handled daily, instead of increasing 25 percent, has *decreased* about 25 percent. The dust offering to the Cottrell, per barrel burned, has been decreased about 40 percent by limiting the dust to one kiln in nodule form and thus minimizing the circulating load;

(5) The burning operation has smoothed out and become more uniform. This is evidenced by lower unit brick costs and reduced down time. The latter provides further production that is in addition to the "capacity" increases indicated above. The total increase in clinker output since adding the fifth kiln and nodulizing system has averaged 29½ percent;

(6) The original, complicated dust-pug mill system, with its high maintenance costs, has been eliminated. The present dust nodulizing installation requires only 55-60 percent of the connected horsepower involved in the original dust disposal system.

Marquette's Mississippi Plant

MARQUETTE CEMENT MANUFACTURING CO., Chicago, Ill., has announced that the new Brandon, Miss., plant is now in production, producing the first cement ever made in Mississippi. In spite of obstacles presented by the severe winter weather of 1950-51, shortages of materials and government restrictions, occasional labor jurisdictional disputes, and by the necessity for quick alteration of certain design details to alleviate rising costs, construction of the plant was completed in a year. Production is expected to be 1,000,000 bbl. annually.

Canadian Asbestos Plant

DOMINION ASBESTOS MINES, LTD., recently announced plans to build a 2200-ton daily-capacity plant at its St. Adrian, Que., asbestos property. Cost of the plant is estimated at $1,425,000. Completion of the plant is expected by early 1953. All exploratory drilling, tunnelling and drifting have been completed. It was stated that the indicated ore body extends over an area 700 x 1800 ft., to a depth of 763 ft., containing approximately 23,000,000 tons. Exploration work done is said to indicate a representative value of $7.65 per ton of the 23,000,000-ton reserve. Mining of the property will be by open-pit method.

Application of Flotation and Other Separatory Practices to Nonmetallics

Principles applied to phosphate, potash, silica, feldspar, beach sands and other minerals requiring high purity

By JAMES A. BARR, JR.

Modern practice in the Florida phosphate fields is to use draglines to dump the matrix into piles and then sluice the material into a sump with hydraulic guns. Pumps deliver to the washer and flotation plant

THERE HAVE BEEN few more important advances in scientific knowledge than the discovery of radioactivity. Even more essential to the advancement of our basic knowledge of mineral-chemical behavior phenomena is the use of radioactivity created artificially through knowledge gained from basic atomic research.

For the benefit of all we have gained new methods in the form of radionuclides which open the way for intense research in the fields of interest to all mineral engineers. They are of interest also in research on biochemistry as applied to oil production and embrace such subjects as bactericidal and bacteristatic characteristics of chemicals used to control the growth of organisms deep within the earth's crust.

It is small wonder that we often become dizzy from our new knowledge which continues to grow at such an incredible speed. Never before have we had such an opportunity to learn the facts about those observations which have been the basis of advancement. Never before have we been given the means of such extreme accuracy of measurement.

To quote from one of our most authoritative sources of information on advanced mineral engineering research, we gain a small idea of the extreme accuracy of our newest methods of measurement:

"The incomparable value of radioactive atoms, which are commonly termed tracers, arises from the extreme sensitivity of this analytical method. To get an idea of this extreme sensitivity it may be useful to recall that gravimetric analytical methods will not permit the weighing of anything much lighter than one one-hundredth of a milligram of material. Under the most favorable circumstances, this represents an uncertainty in the answer of 10^{16} atoms or 10,000,000,000,000,000 atoms. Accurate spectrographic methods possibly have a sensitivity 10,000 times greater than this, but the uncertainty is still in the order of 10^{12} atoms. The tracer permits ascertainment of decay of a single atom so that its sensitivity can be several orders of magnitude greater than that of any other method available to chemists."*

With such accurate tools those who are interested in organic films on mineral surfaces can have information for the asking. Subjects such as the surface active agent required to cause better bond between bituminous products and road aggregate even when the aggregate is wet, or for increasing our mineral wealth far below the surface in the petroleum sands, can be studied in detail. Detailed investigation of those "discrete spheroids" in air-entraining cements, mineral-chemical mechanisms of all types and theories of chemical reactions of cements in concrete are fair game.

*"Radioactive Tracers in Mineral Engineering Problems," A. M. Gaudin and P. L. De Bruyn, Armour Flotation Research Project, Massachusetts Institute of Technology, Cambridge, Mass.

Froth Flotation Review

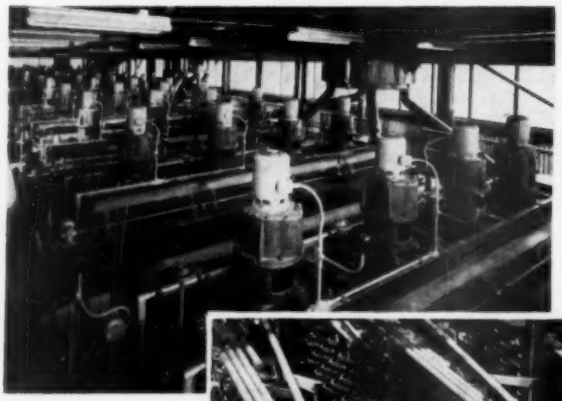
Froth flotation has been developed during this century. However, it is only during the past 20 years that froth flotation of nonmetallic minerals has been desirable or necessary. Until 1926-1927 the industrial minerals were concentrated by methods more simple than froth flotation or were not concentrated at all except by selective mining procedures.

As the high grade deposits became more scarce or someone awakened to the fact that his mill tailings probably carried more values in nonmetallic minerals than the ore offered in metal values, flotation of industrial minerals became more important.

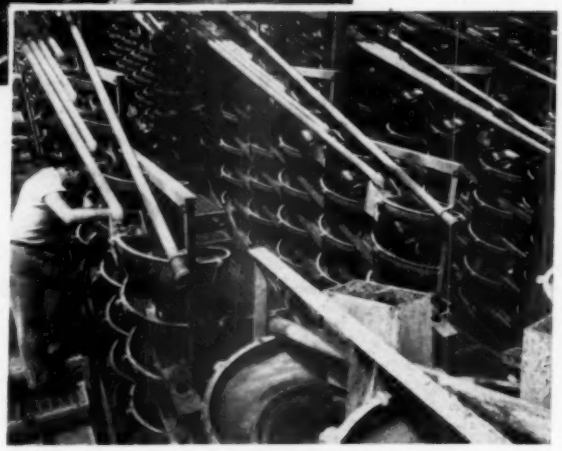
To name only a few of the industrial minerals which are now being concentrated presents an impressive list. As we continue to seek out the trace minerals and those found in the mineral storehouse of pegmatites and granites we become even more conscious of the versatility of the froth flotation process and the unlimited possibilities we have to utilize such tools offered by radioactive flotation reagents containing carbon 14.

Phosphate

A partial list of separations includes such interesting ones as the concentration of phosphate by separating phosphate from silica with fatty acids and then reversing the flotation procedure so that the silica is floated away from phosphate by a high molecular weight aliphatic amine.



Flotation cells like these (110 of them) at Noralyn, Fla., use a fatty acid float for phosphate followed by an amine float for silica



These spiral concentrators at Noralyn are fed dewatered phosphate sands and, through centrifugal force, make a separation of the lighter portion from a heavier silica tailings fraction

Of even greater interest to the welfare of the nation is the discovery that phosphate contains uranium. Even now there is an extensive program being pursued under the auspices of the Atomic Energy Commission to utilize this source of uranium.

The phosphate industry has been a leader in developing new ideas for separating minerals and the handling of materials.

At one time all coarse phosphate (plus 35 mesh minus 14 mesh) was agglomerated with a low grade fatty acid and fuel oil for separation on tables. Present practice includes the same agglomeration methods but also the spiral for separating agglomerates of phosphate from silica. The separation of agglomerated phosphate on underwater screens continues to give excellent results.

The fine fraction (minus 28 or minus 35 mesh) at one time was separated by one process only. Fatty acids were used to froth float phosphate from silica. As the pressure for higher quality concentrates continued, other methods were required to maintain high recovery efficiency and to produce phosphate concentrates at a maximum purity.

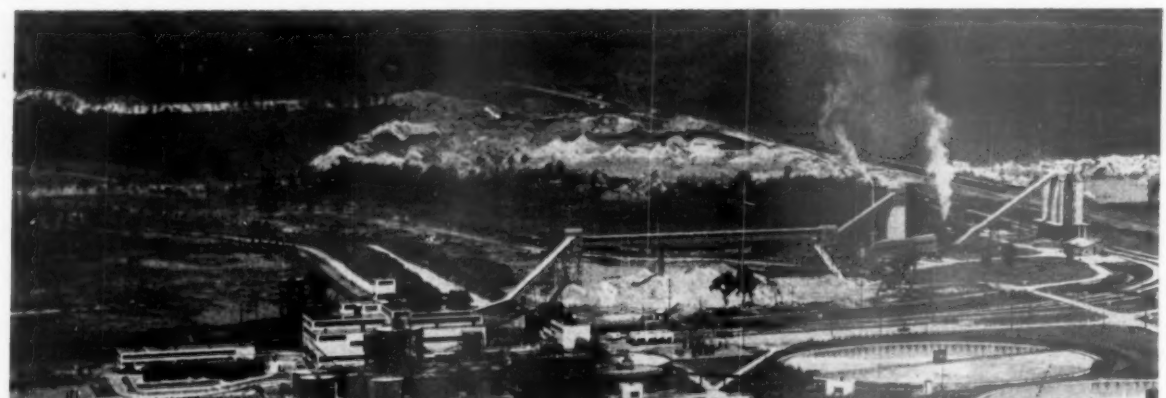
The combination float or double float method was the answer to this requirement. The accepted method today is the separation of phosphate in a fatty acid circuit and the collection of a rough phosphate concentrate in the froth followed by a reversal of the process. The fatty acid flotation reagents are washed off and amines are used to concentrate phosphate further by removing silica in the froth. This combination produces concentrate of maximum grade and allows greatest recovery of available phosphate.

Before flotation separation there must be many unit operations to prepare the ore or mineral-bearing material properly. Draglines are used to strip overburden from the Florida phosphate deposits and to mine the phosphate-bearing strata. The phosphate-bearing matrix is then pulped with water and pumped to a washer.

Many new methods have made long distance pumping an everyday occurrence.

Refinements in separation of slime fractions has led to the development of large size centrifugal separators which take the place of acres of hydroseparators. Known for many years in the phosphate and coal industry, new knowledge and more exacting requirements have led to this most versatile separator. The degree of separation and the rated capacity of 4- to 12-in. hydroclones is astounding.

In addition to the phosphate and uranium, further search disclosed other minor minerals which are of interest today. Most all the marine deposits of Florida contain minor minerals such as ilmenite, magnetite, rutile, zircon, monazite, etc. In proper



The Noralyn, Fla., phosphate plant of International Minerals and Chemical Corp. shown here is the largest in the world, featuring 383-ft. diameter thickeners and separation by both froth flotation and spiral concentrators. There are 110 flotation cells in the plant

concentration they are all of attractive value. For this separation spirals can readily be used since such large tonnages must be used to obtain the minerals in any quantity. Spirals have been well accepted for the separation of heavy minerals in relatively fine sizes whenever the ratio of concentration is very high. Very often the final concentration of the heavy minerals is made by high intensity electrostatic or electromagnetic separators alone or by a combination of electrostatic, electromagnetic and froth flotation procedures.

Potash

Potash is of great importance to the intensive cultivation of our agricultural land. Potash also plays an exceptional role in the manufacture of munitions and industrial chemicals.

Froth flotation of potassium-bearing minerals is now so well established that many older methods which require excessive amounts of heat exchange equipment are gradually giving way to such efficient methods as heavy-media separation and froth flotation in combination or in instances of high quality ores to froth flotation methods alone.

Although there have been several methods for separating potash by froth flotation the process which is most widely utilized requires the use of high molecular weight aliphatic amines to concentrate sylvite (KCl) in the froth zone while halite (NaCl) remains below in the agitated brine.

It is of very considerable interest to be able to separate water-soluble minerals by normal froth flotation reagents. The first requirement is that the suspending medium be a brine saturated with respect to each soluble mineral and that the brine be stable under the temperature requirements of the flotation process. The potash industry has also been a leader in new methods for concentration and in materials handling. Great advances have been made in mining methods and all older methods normal to most underground operations have given way to new, more efficient methods.

Transportation systems have been revised until pneumatic tires on equipment, transportable undercutters, automatic loaders and shuttle cars have transformed the potash mine into a beehive of underground activity.

Communications are of vital importance to all mining operations. The phosphate industry has excellent radio equipment installations.

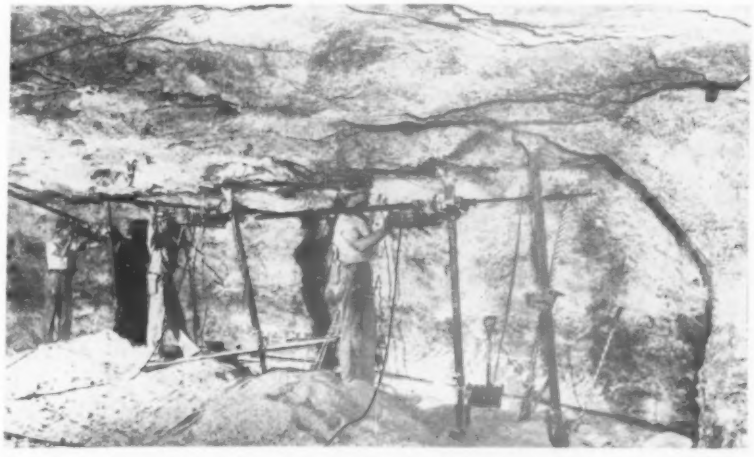
Methods for transfer from mine to mill are most modern. In the mill tremendous capacity is inherent in the flotation process, and grade of the sylvite concentrate is very high. It is relatively easy to obtain grades of 95 percent KCl and it is possible to attain 99 + percent KCl.

Some of the unique things about potash are the sources of supply. Not

(Continued on page 197)

Tabling is also used in the Florida phosphate operations in the separation of phosphate from silica tailings

Mechanized loading equipment in operation at the Carlsbad underground potash mine



At Carlsbad, N. M., modern potash mining techniques feature operations of International Minerals and Chemical Corp. The face here has been undercut and blast holes are being driven. The blast will drop the entire face

Slag Producers Review Year's Activities

THE THIRTY-FOURTH ANNUAL MEETING of the National Slag Association, November 14 and 15 in Chicago, Ill., was one of the most successful ever held, from the standpoint of progress reported and diversity of program. Producers of blast furnace slag are reaping the benefits of an active research and promotion program that has contributed much toward another record-breaking year in 1951. Slag processed for commercial uses very likely will have exceeded 25,000,000 tons for the year.

The program for the Chicago meeting provided an entire session for discussion of activities and plans for the future, and for reports of the managing director and the director of research. A second session was largely devoted to government regulations. The annual banquet was held the opening night and the sessions concluded with the annual business meeting and the election of officers.

C. A. Barinowski, vice-president of Birmingham Slag Co., Birmingham, Ala., was elected president, succeeding E. L. Flad; R. O. Dierker, president, Duquesne Slag Products Co., Pittsburgh, Penn., was elected vice-president; E. W. Bauman, managing director and secretary; and W. S. Shaw, treasurer.

The four members-at-large of the executive committee are: R. Newton McDowell, Gary Slag Corp.; G. A. Mattison, Jr., Woodstock Slag Corp.; E. L. Flad, United States Steel Co.; and W. E. Bliss, Standard Slag Co. C. E. Ireland, Birmingham Slag Co., a former director of the association, was elected an honorary member of the board of directors, and W. C. Ireland takes his place on the board. Dr. H. F. Kriege, France Stone Co., was also elected to the board of directors.

Retiring president E. L. Flad was presiding officer for the opening session and, following the introduction of guests, gave the welcoming address. Mr. Flad was optimistic as to the future for the slag industry and said that the industry was approaching the prediction made some years ago by L. A. Beeghly, Standard Slag Co., who said that some day all the slag produced would be used commercially. To make that prediction come true requires the creation of wider uses for granulated slag and for lightweight slag aggregates.

Mr. Flad paid tribute to the old-timers in the slag industry for their part in its development, to the association problems committees and to Fred Hubbard for his accomplishments as director of research. He believes that the future is good for the use of water-granulated slag in concrete products and possibly also in the field of agriculture.

Managing Director's Report

E. W. Bauman, managing director, summed up the various activities of the association for the past year in his annual report. Principal efforts have been in the fields of promotion, research and in dealings with federal government agencies.

Mr. Bauman started out with a summary of the record and quoted from figures published in the chapter on "Iron Blast Furnace Slag" in the *Minerals Yearbook* published by the U. S. Bureau of Mines.

For each year, beginning with 1946, the industry has accomplished a new record in the production and sale of slag. For the years 1948, 1949 and 1950 the tonnages had increased over the previous year by 8, 2 and 15 percent, respectively, and the value had increased by 15, 10 and 20 percent for the same years. In 1950, the quantity of slag processed for commercial use had increased to a record high of 24,926,033 short tons valued at $29,480,858. A new high is expected for 1951.

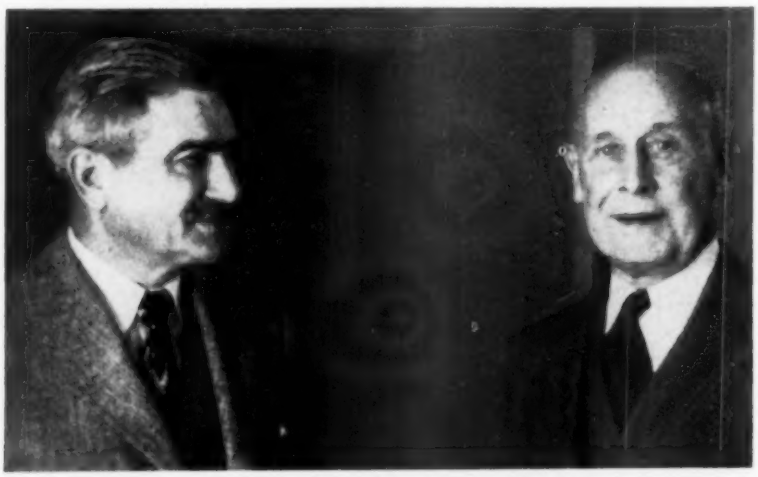
This record was established due to efforts in the fields of research, investigations and sales promotion which, Mr. Bauman cautioned, must be continuously pressed in order that slag not again revert to its former status of a "waste material."

During the past year, the association completed the publication, "Slag Concrete Masonry Units," after almost two years of preparation by the association staff and the problems committee. It is now ready for distribution to member companies at the cost of printing, for use in sales promotion. This manual is an excellent piece of work and was prepared to promote the use of air-cooled, expanded and granulated slag in the manufacture of concrete block. The publication is well-illustrated and deals both with the important properties of slag and the concrete masonry units made from it.

Later, a supplement will be printed based on fire tests now underway at the Underwriters' Laboratories and the shrinkage tests now in progress at the University of Toledo.

The assembly and mailing of individual *Pictorial Portfolios* containing photographs of outstanding slag jobs was accomplished during 1951 and will be a continuing project. It was urged that members submit good photographs of their outstanding jobs for this purpose.

It was agreed that a great deal of educational work among architects is needed and the association is planning to carry a catalog on slag products in *Sweet's Catalog Service* at the earli-



Newly-elected president C. A. Barinowski, Birmingham Slag Co., Birmingham, Ala., left, with retiring president E. L. Flad, United States Steel Co., Pittsburgh, Penn.

Left: Managing director of the National Slag Association E. W. Bauman, left, with C. E. Ireland, Birmingham Slag Co., Birmingham, Ala. Right: W. E. Bliss, Standard Slag Co., Youngstown, Ohio, left, poses for a shot with R. Newton McDowell, Gary Slag Corp., Chicago, Ill.

est possible time. Slag products were listed in the 1951 *Heating and Ventilating Guide.*

Mr. Bauman summarized his many activities in contacts with the National Production Authority, Economic Stabilization Agency and other government offices. At present, the industry is seeking decontrol under the pricing regulations and Mr. Bauman had recently prepared a strong case to O.P.S. in support of such a move.

The slag industry has been placed on the "essential list of activities" issued by the Department of Commerce which may prove advantageous should serious labor shortages develop in the near future. In the field of safety, the association sponsors an interplant safety contest and the record revealed a marked improvement this past year. The *Pit and Quarry* bronze plaques were awarded at a luncheon by Forrest T. Moyer, chief, Accident Analysis Branch, U. S. Bureau of Mines, to the Wylam plant of Birmingham Slag Co., Birmingham, Ala., and to France Slag Co.'s Donora, Penn., plant as winners in the class A (more than 60,000 man-hours) and class B (less than 60,000 man-hours) competitions, respectively. Both plants had perfect records for safety in 1950. There were brief comments on the industry's case for percentage depletion and it was left up to individual members to contact their congressmen on the subject.

Mr. Bauman expressed the industry's appreciation to Standard Slag Co. for its generosity in making it possible for director of research Fred Hubbard to have the freedom to do research for the industry. This research is one of the most important activities and, through this unique arrangement, has yielded many beneficial results to the industry. During 1951, a larger than normal share of the budget was allocated for research.

In touching upon the field of public relations, in which the association is becoming increasingly active, he mentioned the exhibit of slag products of Edward C. Levy Co. at the annual meeting of the American Public Works Association, Detroit, Mich., in September, as an example of what can be done. The company provided a buffet luncheon at the slag plant for the delegates on an industrial plant inspection tour, which created very favorable reactions.

Mr. Bauman gave a summary of his 14 field trips made in 1951 and the various releases put out through his office, and concluded by saying the association is in excellent position both financially and with respect to membership.

Research

Director of engineering Fred Hubbard, in his annual report, summarized the highlights of work in progress and outlined studies that are needed. He began by saying he was in full agreement that an intensive job of sales promotion was needed among architects. For an effective job, one of the main requirements is development of more information on lightweight slag aggregates. In line with this, studies are being made of all important factors, among them freezing and thawing tests, compressive tests, insulation, shrinkage, etc., and granular slags are being similarly studied. Concrete weighing as little as 60 lb. per cu. ft. with 30 percent air entrainment has been produced, having excellent insulation properties.

Data are being developed on blends of slag with natural sands and, during the year, a report was completed on the causes for failures of concrete masonry units made from air-cooled slag. The principal finding is that insufficient water is sometimes used for proper hydration of the cement.

In connection with the Pennsylvania Slag Association which is involved in a legal case as to whether aggregates should be purchased on a volume or weight basis, for competitive reasons, all slags used in the area involved were investigated and specific gravity determinations made for all sizes. That report was completed.

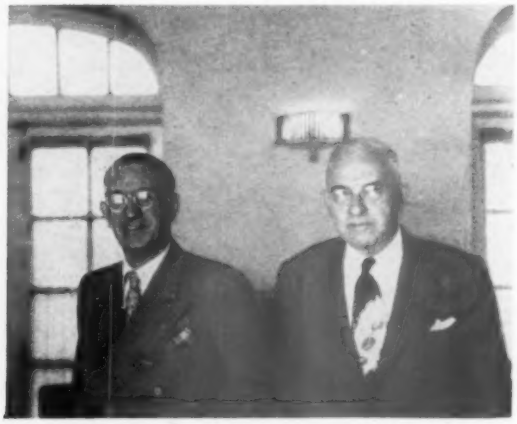
A study will be undertaken of the corrosion of metals when embedded in slag, and pipe are being buried in slag for test purposes. As the result of the work on concrete masonry being done at the University of Toledo, which covers both high temperature and high pressure steam curing, valuable data on volume change are expected to become available soon. Fire tests on slag concrete panels in the study of effects of wall thicknesses are to be made at the Underwriters' Laboratories.

Mr. Hubbard believes there is too much lack of uniformity among lightweight slags from some sources and a reason is that test methods are inadequate. For example, it is difficult to make 4- x 8-in. concrete cylinders that are comparable to the concrete in masonry units. Work is being done in technical committees with a view to developing new specifications for all lightweight aggregates. In conclusion, he touched upon efforts to coordinate laboratory tests on railroad ballast with service behavior. Dr. Kriege mentioned that, according to current thinking, the Los Angeles rattler test for abrasion is no answer to whether or not ballast materials are satisfactory.

Wage and Price Stabilization

With G. A. Mattison, Jr., president of the Woodstock Slag Corp., Birmingham, Ala., presiding, the afternoon session was devoted chiefly to talks by representatives of federal stabilization agencies for wages and prices. Both talks were frank and revealing but both speakers kept reminding their listeners not to accept any of their statements or opinions as authoritative. All such, it was said, must be in specific written form in response to specific written requests.

The representative of the O.P.S. gave only a broad general picture. Up to the time of this meeting, no special case had been made for the slag industry and its pricing methods were those covered in the general regulation



Left: L. E. McDermut, Illinois Slag and Ballast Co., Chicago, left, chatting with G. D. Scheuneman, American Materials Corp., Hamilton, Ohio. Right: C. E. Ireland, Birmingham Slag Co., left, was elected an honorary member of the board of directors. He's shown here with Fred Hubbard, director of engineering for the association

for manufacturers generally. At that time, under the general price ceiling regulation there was no provision for adding the increased cost of inbound freight, but one could add the additional freight cost to the delivered price of his own product. The Capehart amendment was designed to correct such inequities and regulations have since been issued permitting price increases under its provisions. The use of the regulations under the Capehart amendment is optional with the producer.

The speaker for the Wage Stabilization Board was the regional counsel in charge of enforcement of the regulations. He sketched the broad philosophy under which the board has attempted to operate. While he admitted that the so-called wage freeze had been no freeze at all, since up to that time there had been over-all wage increases of $27 billion in 1951, of which 12.8 percent increase over 1950 wages had been made under the regulations without prior approval of the board, he did emphasize that it was hazardous for any employer to advance the wages of his employes without prior notice to the board. He said that in his own region he was getting ready to proceed against illegal increases.

It was never intended, he said, to interfere with the employer's routine methods of salary and wage increases for merit and length of service, or his historical policies in wage and benefit payments. However, all new fringe benefits do require board approval. As far as possible all problems relating to wage adjustments are being handled by the appropriate regional board, of which there are 14, each with 12 members. These regional boards are empowered to increase wages for an employer where it is necessary to bring rates up to a general regional level, if it is a case of hardship and the employer is losing labor as a result. There are severe penalties for violating the law and regulations, much more so than under the regulations of the former War Labor Board. So far as the speaker was concerned, he said the law in the Chicago region was being enforced. The plan is for the regional boards to make most of the rulings, with only the uncertain or difficult cases being referred to the national board, which has 18 members. He said that the chief difficulty met with by the boards was that 90 percent of all the petitions for wage increases filed failed to contain all the required facts.

Slag Problems

A round-table forum was led by Fred Hubbard, director of engineering of the association and Ed Levy, Detroit, Mich., slag producer. Mr. Hubbard discussed the value of granulated slag in agriculture. He said that slag is probably as effective as agricultural limestone of an equal degree of fineness. It usually contains all the desirable trace elements, although sometimes not enough copper and zinc as might be required for soils especially deficient in these elements. In some instances, Mr. Hubbard said, granulated slag has given better results than limestone. A new soil-liming manual is being prepared on the use of slag in agriculture to be published for general distribution to farmers.

J. W. McBurney, National Bureau of Standards, discussed lightweight aggregates, of which specially processed slag is one. He referred to an unpublished report of tests made at the Denver, Colo., laboratory of the U. S. Bureau of Reclamation and the Bureau of Standards, a research financed with funds supplied by the Housing and Home Loan authorities. Tests were made of concretes of 500,-1000- and 2000-p.s.i. compressive strengths with and without reinforcement. He cautioned against attributing cracks due to faulty foundation to faulty concrete. He said it was often difficult to tell whether cracks were caused by expansion or contraction, but he did find that shrinkage increased in proportion to the lightness of the aggregate.

Dr. Kriege, told of work on concrete block at the University of Toledo, where it was found that the greatest shrinkage occurs at less than 40 percent relative humidity. It is difficult, he said, to tell to what extent the aggregates and cement enter individually into the problem of volume changes. The search for practicable means of preventing shrinkage is well worthwhile, he said, and it would seem that some solutions to the problems are in sight. Cracks in block walls, he said, almost invariably start in the mortar joints, making it appear that the cementitious material is the primary difficulty.

Mr. Levy, of Edward C. Levy Co., spoke mostly about handling of open-hearth slag for recovery of the steel it contains. This slag is not usable for aggregate, or for hardly any other use than for fills, because it disintegrates on exposure to the weather. This is because it is a relatively high-limed slag and on exposure the alpha and beta dicalcium silicate reverts to the gamma form, which is a powder at ordinary temperatures. Mr. Levy's operation is therefore different from a commercial slag-crushing and screening plant. He said that the important consideration is adequately sized machinery for handling heavy lumps. By simply sprinkling the large lumps with a continuous spray of water, they break up and the larger pieces of steel they may contain can be directly recovered—about 50 percent of all the steel they contain. The rest of the steel is recovered after crushing, screening and magnetic pulley operations. About 12 to 15 percent of the slag handled is recoverable steel, which goes back to the furnaces.

The evening program consisted of a banquet, at which C. A. Barinowski presided as toastmaster.

Convention Programs of Aggregates Industries

THE 36TH ANNUAL CONVENTION of National Sand and Gravel Association and the 22nd annual convention of the National Ready Mixed Concrete Association will be held in Chicago the week of February 11. The equipment exposition to be held in conjunction with the convention will be the largest in the history of the association. The convention hotel, the Conrad Hilton, though it has the largest hotel exhibit area in the world, was overtaxed. Exhibit areas will be set up in the exhibit hall lobby and on the mezzanine floor to accommodate the more than 180 exhibitors. Some heavy equipment will be displayed in parking lots near the hotel; these will be described in the convention program available at the registration desk.

A schedule of the convention program is given here by dates:

Monday, February 11

The N.S.G.A. board will meet in the morning. Following a joint luncheon of the two boards, the N.R.M.C.A. board will meet in the afternoon. Financial reports and preparation of budgets will occupy the boards. A final decision on the place and date of the 1954 convention-exhibit will be made.

Tuesday, February 12

A joint opening session of the two associations will be held, at which the two presidents will make their addresses. J. L. Haynes, director of National Production Authority's Building Materials Division, will talk about the prospective allocation of controlled materials for defense and non-defense construction in 1952. Two national figures in the highway field will give talks on the accumulated highway requirements of the United States.

A brunch for the ladies will begin at 11 a.m. An interpretation of "The King and I" will be given.

The afternoon session of N.R.M.C.A. will be on merchandising, with Robert C. Collins as moderator. A general review of the merchandising problems of the ready-mixed concrete industry will be presented by Mr. Collins. A panel of four experts will deal with aspects of the merchandising question: lightweight aggregates; the growing problem of weight restrictions; problems of overloading; use of admixtures; controlling mixing and agitating time; the problem of additional mixing water at the job; methods of discharge which will avoid segregation; and advertising, both newspaper and radio.

Tuesday night the annual Manufacturers Reception will be held.

Wednesday, February 13

N.S.G.A. and N.R.M.C.A. will hold a joint session in the morning. Fred Bergraff of the Highway Research Board will talk about axle loads. Stanton Walker, director of engineering, will present his annual report. G. D. Kennedy of the Portland Cement Association will talk about concrete for highways. K. B. Wood, Purdue University, will discuss concrete pavement life in relation to aggregates.

The two associations at a joint luncheon will hear Clarence Manion, dean of the law school of Notre Dame.

N.S.G.A. will have an afternoon session at which the association's tax counsel, John T. Sapienza, will lead a discussion on percentage depletion.

Thursday, February 14

A joint session of the two associations will be held in the morning. There will be informal discussion of priorities and the allocation of materials by NPA; price control, and wage and salary control. There will be a panel of four members with a moderator; the four panel members will be Walter Acheson of OPS; George Roll of Defense Minerals Administration; Charles Horsky, association counsel, and Vincent P. Ahearn, executive secretary of the association.

There will be a simultaneous N.S.G.A. session on operating problems. The program will include a discussion of the Eliot plant of Pacific Coast Aggregates by R. K. Humphries, and other material dealing primarily with fine aggregate production.

A joint N.S.G.A. and N.R.M.C.A. session will take place Thursday afternoon. Vernon E. Lohr, chairman of the collective bargaining committee for the Southern California Rock Products Association and the Southern California Ready Mixed Concrete Association, will describe the procedures used by the two groups in collective bargaining negotiations with AFL unions which led to the recent renewal of contracts with these two unions. F. E. Schouweiler, president of Old Fort Supply Co., Fort Wayne, Ind., will tell about the successful outcome of his suit against the Common Laborers Union in Muncie, Ind., in which Mr. Schouweiler recovered damages against the union for its effort to bar his company from delivering concrete. Mr. Horsky will talk about recent decisions of the National Labor Relations Board which affected the two industries, including group bargaining, secondary boycotts, the collection of union dues, and other cases growing out of provisions of the Taft-Hartley Act. Mr. Ahearn will present his annual report at this joint session.

Friday, February 15

N.S.G.A. and N.R.M.C.A. will hold separate concluding sessions on Friday morning. W. E. Hole, president of American Aggregates Corp., Greenville, Ohio, will talk at the N.S.G.A. session on the growing problem of zoning restrictions and rehabilitation of worked-out sand and gravel properties. C. E. Proudley of the North Carolina Highway Department will discuss the use of sand and gravel in bituminous mixtures. N.S.G.A. safety trophies provided by ROCK PRODUCTS will be awarded, and officers for 1952 will be elected.

N.R.M.C.A. will present its safety trophies to the winning companies in its competition. Ralph Anderson, president, W. E. Anderson Sons Co., Columbus, Ohio, whose plant won the contest in the larger plant group, will tell how his company has worked out a safety program. A talk will be given describing activities of the associations' laboratory. Officers will be elected for 1952.

CRUSHED STONE ASSOCIATION MEETING

AN INTERESTING AND important program is scheduled for the 35th annual convention of National Crushed Stone Association, to be held at the Conrad Hilton hotel in Chicago, February 17-20, the week following the conventions of National Sand and Gravel and National Ready Mixed Concrete Associations. The exposition in the hotel exposition hall will also be of much interest.

Sunday, February 17

Manufacturers Division board of directors will meet in the morning, and in the afternoon the N.C.S.A. board of directors will meet.

Monday, February 18

The morning session will be opened by greetings from the association president and announcement of elections by the board of directors. Reports on business conditions during 1951 and the outlook for 1952 will be summarized by the regional vice-presidents and presented by the president. Reports of the association staff, the engineering director, field engineer and administrative director are also scheduled.

A greeting luncheon will open the social activities. An address will be given by Dr. William H. Alexander, pastor, First Christian Church, Oklahoma City, Okla. A cocktail party and buffet dinner will be held in the evening. The Manufacturers Division exposition will be open all afternoon.

Tuesday, February 19

The morning session will be primarily for operating men and equipment manufacturers. Drilling practices will be discussed by E. F. Haberkern, production manager, Columbia Quarry Co., St. Louis, Mo. Primary blasting practices will be described by T. C. Cooke, president, Lynn Sand and Stone Co., Swampscott, Mass. Quarry safety practices will be the subject discussed by C. A. Gustafson, superintendent, Callanan Road Improvement Co., South Bethlehem, N. Y.

The Manufacturers Division will hold its annual luncheon business meeting on Tuesday.

Reports of the following committees will open the afternoon session: auditing, resolutions, percentage depletion and group insurance committees. C. M. Noble, chief engineer, New Jersey Turnpike Authority, will describe the turnpike pavement design and construction. "Practical Application of a Percentage Depletion Allowance to Crushed Stone" will be the subject of a talk by J. W. Haley, vice-president, Jewell Ridge Coal Corp., Washington, D. C. Wage and salary controls will be explained by John C. Gall, general counsel of N.C.S.A.

Wednesday, February 20

The morning will be devoted to an inspection of the equipment exhibition.

The association's luncheon will be on Wednesday, when Samuel Grafton, New York news analyst, will present an address. C. A. Gustafson, chairman of the N.C.S.A. accident prevention committee, will make the presentation of safety contest awards.

Three talks of wide scope will be presented in the afternoon session. Harold A. Montag, director, Mining Division, Defense Minerals Procurement Administration, Washington, D. C., will point the outlook for MRO and major capital additions for 1952. "The Microscope and Aggregate Behavior" is the subject scheduled by Robert H. Nesbitt, geologist, Office of the Chief of Engineers, Department of the Army, Washington, D. C. "A 'Tailored' Price Order for the Crushed Stone Industry" will be discussed by Walter H. Acheson, chief, Building Materials Branch, Office of Price Stabilization, Washington, D. C.

A reception and banquet in the Grand Ballroom of the hotel will close the social program of the convention. James D. Arrington, editor and publisher, Collins *News-Commercial*, Collins, Miss., will be banquet speaker.

Booth Equipment Descriptions

PRODUCTS AND INFORMATION to be at exhibitors' booths is given in the following list. The asterisk (*) before the company name indicates the exhibit to be part of the National Crushed Stone Association show. No symbol signifies that the display is at the National Sand and Gravel and National Ready Mixed Concrete Associations combined exhibition. A double asterisk before the company indicates that the company is exhibiting at both conventions.

****Allis-Chalmers Manufacturing Co. Booths 77-78-79-80-81-82**

Equipment on display will include an operating 3- x 8-ft. Ripl-Flo screen with Thermo-Deck heating unit for screening moisture-bearing materials; a model of an A-1 jaw crusher with dry-rolling toggle; a solids handling pump and vibrating screen mechanism; a rubber-lined sand pump; bearings for the Ripl-Flo screen and a complete line of Texrope sheaves. The tractor division will show the HD-5G Tracto-Shovel.

***American Cyanamid Co., Explosives Department Booth 21**

Picture story on correct blasting methods. Featured will be the new shipping-loading container for explosives.

****American Manganese Steel Division American Brake Shoe & Foundry Co. Booths 55-56**

Working model of pump for recovery of sand and gravel; model of renewable lip-type dipper; new two-piece Rever-sharP tooth; some examples of how hard-facing welding rods can be used in the sand and gravel industry, and new "Wear-sharp" repointer bars for dipper teeth.

***Atlas Powder Co. Booths 84-85**

Demonstration of millisecond delay blasting techniques in "peep show" movie machine; viewer will be able to stop movement of filmed quarry blasts at any point to examine action of the rock.

****Austin-Western Co. Booths 33-34**

Background panel of pictures, including illuminated transparencies, of installations. Also sound and color movies.

Autolene Lubricants Co. Booths L-16, L-17

****Bacon-Pietsch Co., Inc. Booth 87**

****Baldwin-Lima-Hamilton Corp., Lima-Hamilton Division Booths 35-36**

Display background with photographs of the various types and sizes of equipment manufactured by the Lima works of the company.

****Barber-Greene Co. Booths 38-39-40-41**

Scale model of aggregates plant complete with miniature drive, take-ups, chutes, etc. Colored photographs and murals of equipment installations. Display of conveyor carriers.

Blaw-Knox Division, Blaw-Knox Co. Booths 27-28-29-44-45-46

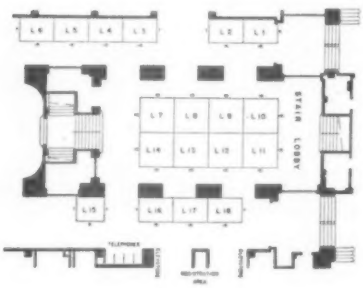
Cutaway model of a silent automatic-type transmission and a cutaway of the hopper seal. A 4½-cu. yd. truck mixer will be featured, along with a working model clamshell bucket.

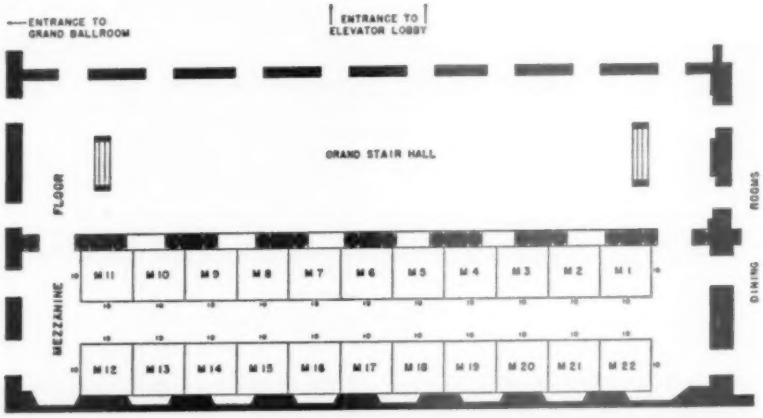
****Bucyrus-Erie Co. Booths 59-60**

Photographic presentations of quarry, mining and general purpose excavators, blast-hole drills, tractor equipment, the Hydrocrane and walking dragline. Featured will be the new 6-cu. yd. model 150-B excavator.

****Buda Co. Booth 17**

New 6-DA-844 Dyna-Swirl diesel




ENTRANCE TO GRAND BALLROOM
ENTRANCE TO ELEVATOR LOBBY
GRAND STAIR HALL
MEZZANINE FLOOR
M11 M10 M9 M8 M7 M6 M5 M4 M3 M2 M1
M12 M13 M14 M15 M16 M17 M18 M19 M20 M21 M22

Additional lobby (above right) and mezzanine exhibit areas for the National Sand and Gravel and National Ready Mixed Concrete Associations exposition

engine and other heavy-duty diesel power units and generator sets.

Butler Bin Co. Booth 102

****Caterpillar Tractor Co.** Booths 4-5-6

Cutaway model of the "Cat" D397 engine will be on display, as well as a cutaway of the fuel injection system.

****Chain Belt Co.**
Booths 67-68-69-84-85-86
***Booths 22-23**

Rex impact idler, spiral return idler and chain drives. Chain sample table showing typical drive and conveyor chains. Photographs of on-the-job applications.

Cleaver-Brooks Co.
Booths 106-107-108

A 30-hp. steam boiler and a hot oil circulating heater, the latter intended for heating bituminous and heavy viscous materials up to a temperature of 400 deg. F.

Concrete Magazine Booth M-19

Concrete Transport Mixer Co.
Booths 119-120-121

Exhibit of the line of ready-mixed concrete equipment, including the Hi-Lo truck mixer and the new Rocket truck mixer.

Construction Machinery Co.
Booths 116-117

New Transcrete truck mixer on display.

Contractors and Engineers Monthly (magazine) Booth M-7

Cook Bros. Equipment Co.
Booths 112-113

Photographs and parts display of complete Challenge truck mixer line. Outside the exhibit hall will be on display an M3-10 heavy-duty three-axle mixer truck with 6½-cu. yd. mixer.

****Cross Engineering Co.** Booth C

Line of screens, including Cross Hexscreen, square, and round perforations.

****Cummins Engine Co., Inc.**
Booths 103-104-105

****Deister Machine Co.** Booths 53-54

New type double-deck 4- x 12-ft. vibrating screen equipped with "lifetime vibrating mechanism."

Dewey and Almy Chemical Co.
Booth D

****Diamond Iron Works, Inc.**
Booth 130

Photographs, pictures, descriptive literature and catalogs.

***E. I. du Pont de Nemours & Co.**
Booths 64-65

Literature and plant representatives.

Dumpcrete Division, Maxon Construction Co. Booth L-18

Scale working models of the Dumpcrete mounted on truck chassis on display, as well as colored action photographs of bodies.

Eagle Iron Works Booths 98-99

***Easton Car and Construction Co.**
Booths 68-69

Display photographs and literature, featuring the new Easton gooseneck side-dump trailer to fit the Caterpillar tractor.

****Euclid Road Machinery Co.**
Booths L-13, L-14
***Booths 9 and 24**

Display featuring the use of 13-cu. yd. bottom-dump and 10- to 34-ton capacity units.

Flexible Steel Lacing Co.
Booths L-11, L-12

A 19-ft. long conveyor with 24-in. conveyor belt joined in several places with the company's various belt fasteners.

***Frog, Switch & Mfg. Co.** Booth 102

****General Electric Co.** Booths 88-89

Motion picture "Pipeline to the Clouds" will be shown, also application photographs of equipment in use in plants.

***Gulf Oil Corp., Gulf Refining Co.**
Booth 106

****Harnischfeger Corp.** Booth 7

P&H model excavator with Magnetorque control; electric clutch shovel crane and dragline applications; lift hoist in operation, and diesel power unit.

****HarriSteel Products Co.** Booth 37

Sections of screen cloth of various weaves, featuring the Wabbly Weave self-cleaning cloth, also a special cloth for dewatering applications.

The Heltzel Steel Form & Iron Co.
Booths 9 and 24

Three scale models of widely used batching plants, consisting of 300-ton combination batching plant, and portable bulk cement and portable aggregates plants.

****Hendrick Manufacturing Co.**
Booths 109-110

Pictures of installations and samples of the various types of screen materials, both perforated and wedge slot.

Hercules Motor Corp.
Booths 127-128-129

An 8-cyl. model DNX-V8D power unit, also several 4-cyl. gasoline and diesel power units for truck mixers.

***Hercules Powder Co.** Booths 44-45

****Hewitt-Robins, Inc.**
Booths 72-73-74-75-76

Units of machinery in operation will include 24-in. wide sectional belt conveyor, a double-deck 60- x 114-in. Vibrex screen with ball-tray deck and a 30- x 60-in. Vibra-Veyor. Also exhibited will be hose and belting.

The Frank G. Hough Co. Booth 87A

Model HM Payloader and photographs of units in operation in sand and gravel plants.

Imperial Construction Equipment Co. Booth L-10

****International Harvester Co.**
Booths 114-115

****Iowa Manufacturing Co.**
Booths 134-135

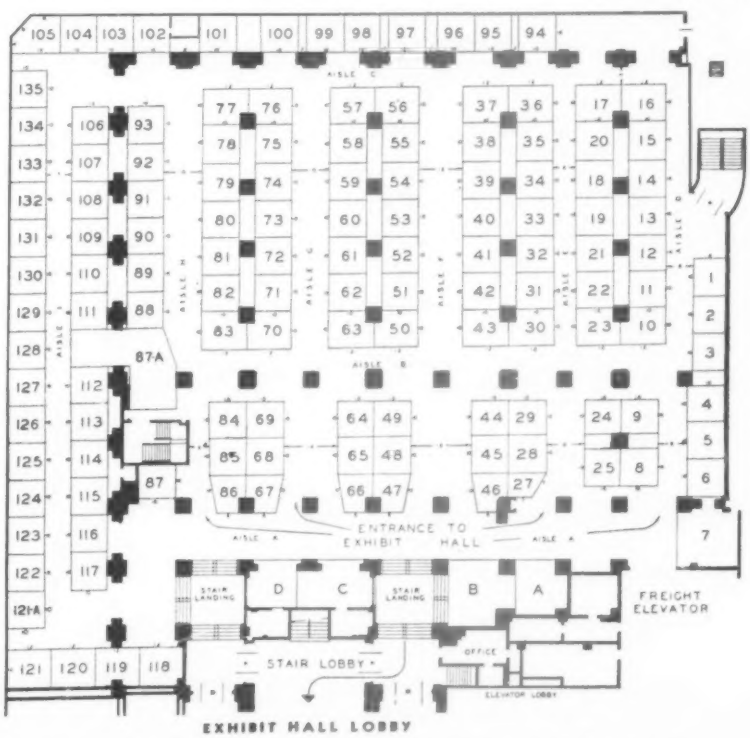
Model of vibrating screen and double impeller crusher.

The Jaeger Machine Co.
Booths 50-51-52-61-62-63

Two truck mixers, a 4½ and a 6½ cu. yd. unit, with details of construction features illustrated by three-dimensional sections of subassemblies.

***Jeffrey Manufacturing Co.**
Booths 51-52

(Continued on page 184)



Main exhibit hall area for both the crushed stone and sand and gravel expositions

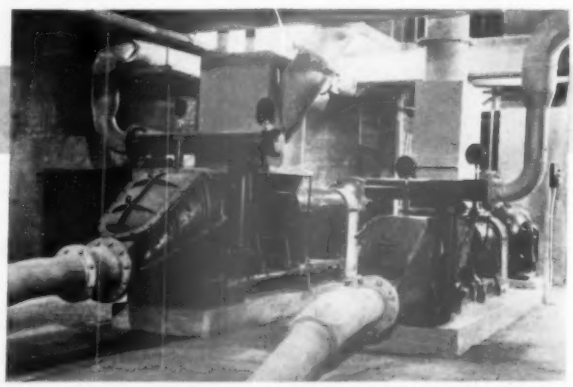
FULLER STARS

at the outstanding new Lone Star, Virginia, plant

In Lone Star Cement Corporation's new Virginia dry-process cement plant, Fuller Conveying Systems are used in transporting cement from one operation to another...the fastest, most economical and convenient way to handle cement in the plant.

Lone Star also uses Fuller-Kinyon pumps, abrupt-quenching Fuller Inclined-Grate Coolers, Fuller Compressors and F-H Airslides in its plants.

And that's why whenever you plan to expand your facilities, call on Fuller. It's your first step toward more efficient handling practices. Write the **FULLER COMPANY**, Catasauqua, Pennsylvania.



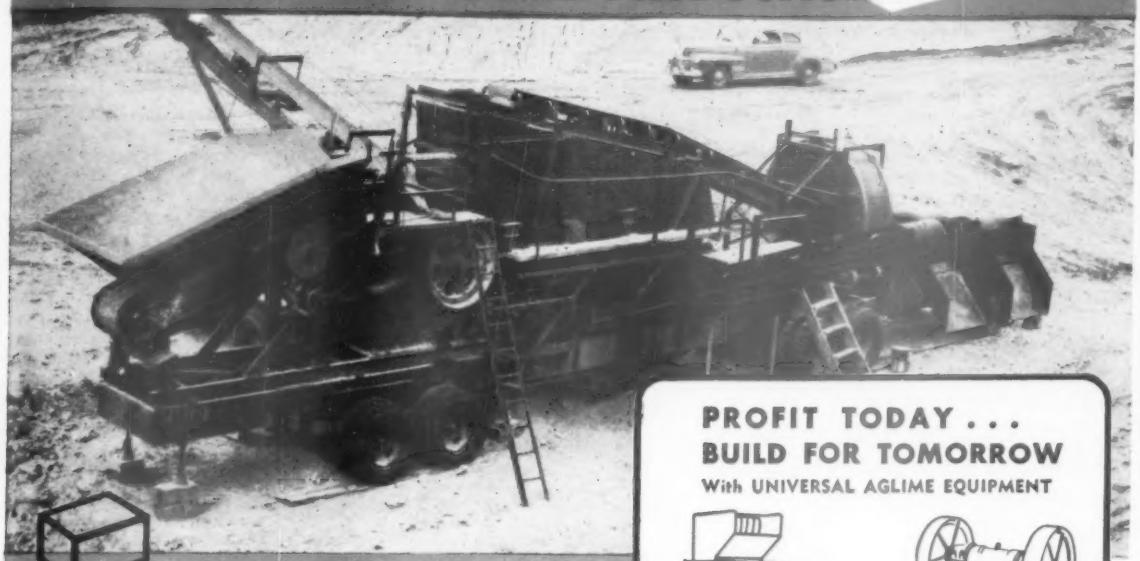
★ **Fuller-Kinyon 9" 80-ton Type H Pump (left) conveys raw materials a distance of 592 ft. from tube mills to silos. Air is supplied by a Fuller Single-stage 1044 c.f.m., 26 psi, Rotary Compressor, capacity 1044 c.f.m., 26-lb. pressure.**

Fuller-Kinyon 8" Type H Pump (right) conveys finished Portland cement from tube mills to storage silos, capacity 360 bbl. an hour. Maximum conveying distance approximately 502 feet. Air for conveying, supplied by a Fuller Single-stage Rotary Compressor, capacity 1400 c.f.m., 26-lb. pressure.

UNIVERSAL

FOR PROFITABLE AGLIME PRODUCTION

COMPLETE PACKAGE UNITS



THE UNIVERSAL 293QH LIMEROK
A COMPLETE QUARRY PLANT IN ONE PACKAGE

Here's high portability, extreme flexibility, and profit-making capacity that lets you produce aglime in volume near your market, or shift to road rock when the season changes. The Universal 293QH Limerok is engineered for top output and economy with high capacity jaw crusher primary, hammermill secondary and gyrating screen mounted on a single chassis. It loads direct from quarry and produces aglime, road rock and chips simultaneously or separately. Delivers finished material to trucks or stockpiles. A smooth operating, proved profit-maker.

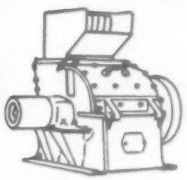
THE UNIVERSAL 546P PORTABLE PRIMARY CRUSHING UNIT

THE UNIVERSAL 1800 SERIES PORTABLE HAMMERMILL SECONDARY CRUSHING UNIT

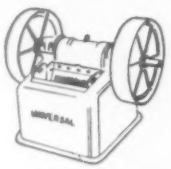
The 546P Primary and 1800 Secondary, available in various sizes, make possible the selection of a balanced combination to meet a wide range of production requirements.

Portable or stationary—whatever your requirements for producing essential aglime UNIVERSAL builds the combination you need for more tons per hour at lowest cost per ton. Contact your Universal distributor for complete information or write direct.

PROFIT TODAY . . .
BUILD FOR TOMORROW
With UNIVERSAL AGLIME EQUIPMENT

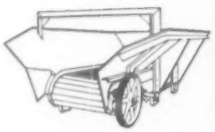


Hammermills



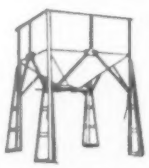
Jaw Crushers

Aglime Screens



Apron Feeders

Aglime Conveyors



Aglime Bins

UNIVERSAL ENGINEERING CORPORATION Division of PETTIBONE MULLIKEN CORPORATION

617 C Avenue N.W., Cedar Rapids, Iowa
Phone 7105

4700 West Division St., Chicago 51, Illinois
Phone Spaulding 2-9300

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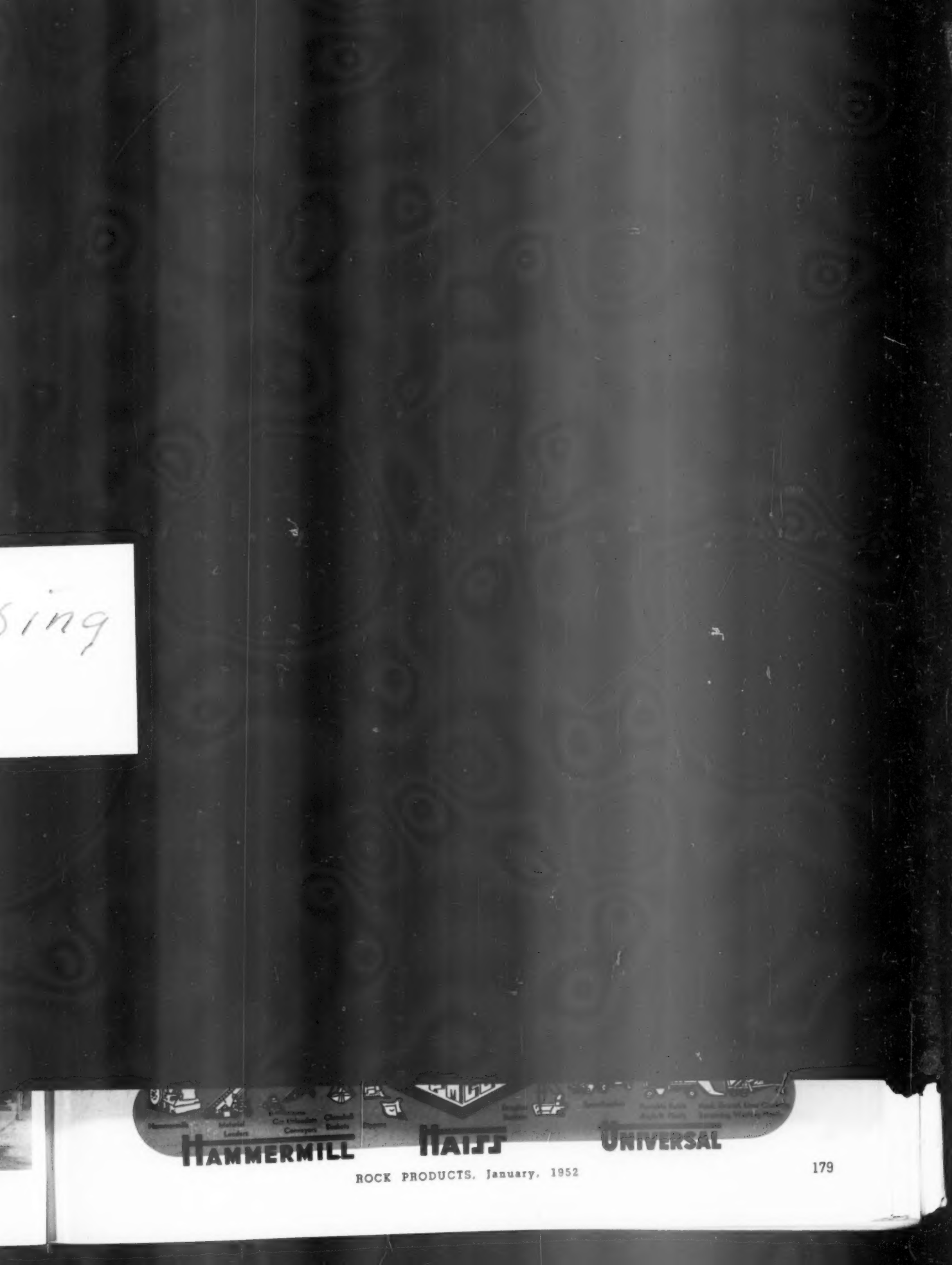
pressure.

Fuller-Kinyon 8" Type H Pump (right) conveys finished Portland cement from tube mills to storage silos, capacity 360 bbl. an hour. Maximum conveying distance approximately 502 feet. Air for conveying, supplied by a Fuller Single-stage Rotary Compressor, capacity 1400 c.f.m., 26-lb. pressure.


HAMMERMILL
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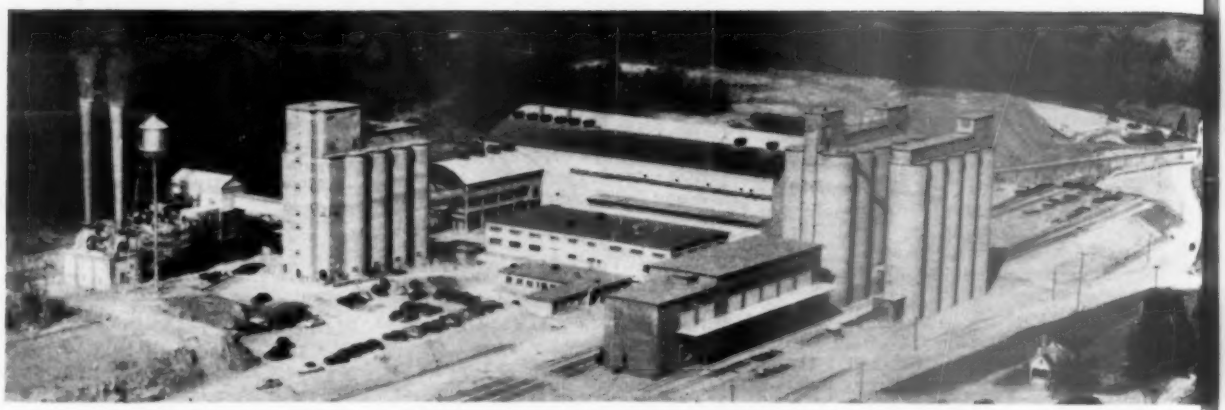
UNIVERSAL

FULLER STARS



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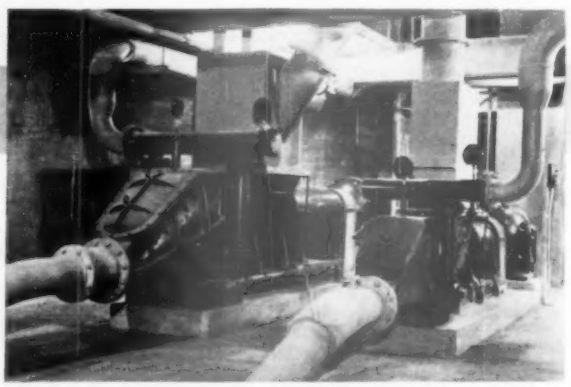

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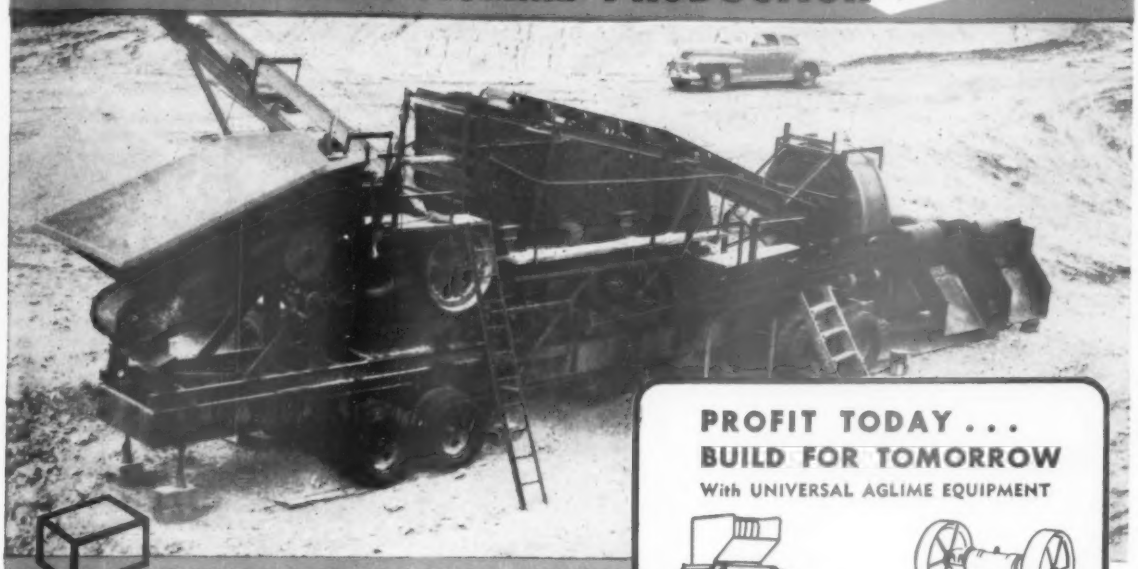
COMPLETE PACKAGE UNITS



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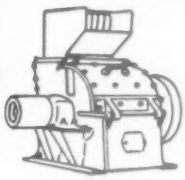
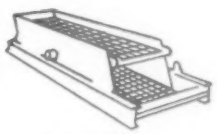
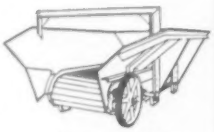


Hammermills

Jaw Crushers



Aglime Screens



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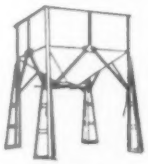

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Phone Spaulding 2-9300

Aggregates Quality Stressed

(Continued from page 130)

Co., Superior, Ariz.; (6) September, 1951, page 67, methods used by Miami Copper Co., Miami, Ariz.; (7) October, 1951, page 113, methods used by Kennecott Copper Co., Ray, Ariz.; (8) December, 1951, page 118, methods used by Shattuck Denn Mining Co., Iron King Mine, Humboldt, Ariz.

The use of surge piles is becoming more general as smaller operators are finding them to be advantageous. We encountered one portable plant that had a surge bin immediately following the primary crusher. Winter conditions can adversely affect the efficiency of a surge pile containing wet materials, so surge bins might have the advantage of being easier to thaw out with some type of portable heater, or they might be enclosed. A central Iowa operator uses an open-topped surge bin of 500 tons capacity as an early step following suction dredge recovery.

In a Western sand and gravel operation a new type of wagon was put into service. It is known as the Cobra Wagon and is a development of Wooldridge Manufacturing Co. The body of the haulage unit holds 25 tons and is filled by a dragline. To unload, the rear end of the truck is spotted over the desired point, and a winch mounted on the carrier pulls the body of the truck backwards, scraping the bed and unloading at the same time. The unit can dump in one spot or act as a spreader.

In the crushed stone industry portable and semi-portable plants have played a large part in extension of the industry's capacity. This subject is covered in more detail in another article in this issue. Due to the expenditure of great sums of money for atomic energy development there was a flurry of new plant construction in the affected areas, as well as additions to plants already established. Near Augusta, Ga., Columbia, S. C. and Paducah, Ky., new plants went into production to supply construction needs for atomic energy plants.

Plant Improvements

Established plants, to a large degree, sought to improve over-all operating efficiency by purchasing such items as large capacity apron feeders to feed the primary crushers. Feeders at such locations insure a continuous and even feed to the primary unit. ROCK PRODUCTS described, in the July, 1951, issue, page 70, a modern crushed granite operation that went into service in South Carolina. A new plant in the south Mississippi river drainage basin went through preliminary trial runs. This plant prepared crushed limestone and is one of the United States' most modern crushed stone operations.

Another example of the trend for greater efficiency and efforts directed toward lowering operating costs was the installation of a 10-cu. yd. Bucyrus-Erie 650-B dragline for stripping by one of the nation's largest producers of agricultural limestone and fluxstone (ROCK PRODUCTS, May, 1951, page 79).

The removal of flat and elongated particles is a serious problem to many operators, and in cases where this condition must be corrected there has been considerable cost for installation as well as higher operating costs. In several instances hammermills that operated without grids were being used on a sized feed. The intent was not to crush but only to give the materials a slap and to break the slivers into two or more shapes. In such cases hammers had to be reversed every 4 hr. and refaced with a hard surfacing welding every 8 hr. In the October, 1951, issue, page 103, and in the November, 1951, issue, pages 103 and 105, two such installations were described. In the December, 1949, issue, page 119, ROCK PRODUCTS described and gave operating data on the use of so-called "up-enders" to screen and segregate flats and slivers.

Disposal of the finer sizes of crushed stone has led to the expansion of black top plants. One of the newer processes uses a method based on a cold mix. This process, called Amalga-Pave, derives its name from the fact that two separate petroleum fractions amalgamate with each other during mixing and laying. Powdered asphalt is used, having an 0-5 penetration and a melting point above 250 deg. F.; it is prepared by a small impact mill. So-called "B.G.S." liquid flux oil is used, which has the ability to displace the moisture from the aggregates, thus eliminating the use of heat. The process is a development of Union Oil Co. and is being exploited by National Amalga-Pave, Inc. Plants are in production in California and Montana and new ones are being constructed in Oklahoma and Florida.

The Atomic Energy Commission is making an intensive search for new sources of radioactive materials. It is reported that Geiger counters are being lowered into previously drilled oil well holes with the hope of making a new discovery. Prospectors are being financed and large mining companies are receiving funds well into the millions to be spent in the search for new sources. Possibly the crushed stone producers will be approached. At any event we believe that producers, especially if the rock being quarried is of volcanic or igneous origin, should have a spectographic analysis made of representative materials. It would be helpful for one to know the mineralogical content of his products and a spectographic analysis done by competent laboratories will give an accurate and quick picture even of the trace minerals.

Experimental Quarry

Some interesting work has been underway by the U.S. Bureau of Mines at Rifle, Colo. Much of the experimental work in the development of a cheap underground quarry will redound to the benefit of the entire crushed stone industry. So-called oil shale is a magnesium marlstone rich in organic matter. Physically, it resembles many of the limestone deposits somewhat stratified horizontally and having hardness and toughness comparable to limestone.

Studies to produce rock cheaply have been underway for years, culminating in the development of a two-level underground quarry which uses some novel pieces of equipment including a telescopic rig that has a scaling platform rising to a maximum 65 ft. It is mounted on a Mixermobile unit that is powered by a 6-cyl. Hercules engine. Similarly a mobile blasting platform for loading high breast and back holes is used. A second scaling rig using a Superior revolving crane mounted on a TD-9 International tractor has a 27-ft. lift and a self-leveling platform. Another scaling device is the use of an industrial gun made by Remington, which uses a lead shot weighing three oz. (about 8 gauge) and resembling a shotgun shell. Its main use has been to shoot down large icicles and smaller rock. The bullet at 50 yd. delivers a blow equivalent to about 2.9 ft.-tons.

A mobile compressor unit capable of turning out 1540 c.f.m., consisting of two Joy two-stage compressors, is in use. By moving this compressor close to the face it is said that the efficiency is increased 12 percent because the air is used before the heat energy in it is displaced.

Drill jumbos for drilling breast holes and uppers have been developed to a high degree. A jumbo uses two platforms mounting two drills on each platform with one man running two drills. Down holes are drilled from a second mobile jumbo that uses vertical percussion drills mounted on an RD-8 Caterpillar tractor. Four 15-ft. drills are used and these can be spotted fore, aft or on either side. All of the foregoing items were designed by engineers of the Bureau of Mines.

A series of studies is being carried out to determine how large an underground room or stope can be. The mine makes use of the room and pillar system with entry through suitable tunnels. Rooms have been widened gradually following a procedure to widen by increments of 10 ft. and to make daily observations. The room is now 80 ft. wide and 100 ft. long. One novel method used to predict failures is the use of geophones placed in the roof rock. These geophones pick up sub-audible noises due to rearrangement of rock crystals as a result of strains. Amplifiers and recorders are a part of this study.

Of minor interest to quarry operators is the development of a horizontal-type rotary drill. The underground quarry features a 3-cu. yd. Bucyrus-Erie electric shovel with 15-ton Eu-

Protect high-speed Diesels in quarry service against ring sticking and excessive wear

with

GULFLUBE MOTOR OIL H.D.

High-speed Diesels in dusty quarry service need high quality detergent-dispersant oils, the type depending on the severity of service.

For the majority of engines Gulflube Motor Oil H.D. is recommended. This high quality oil has a rich paraffin base and sufficient detergency to protect Diesel engines under most operating conditions.

For engines in low temperature operation, extra heavy-duty operation or for those using high sulphur fuels, Gulflube Motor Oil X.H.D. or Gulf Super-duty Motor Oil may be the preferred recommendation. They contain larger quantities of detergent and have alkaline properties which prevent corrosion of cylinder walls, and resulting wear under these severe operating conditions.

For additional information leading to better lubrication and maintenance of your Diesel engine, call in a Gulf Lubrication Engineer. Write, wire or phone your nearest Gulf office.

GULF INDUSTRIAL LUBRICATION

Gulf Oil Corporation · Gulf Refining Company

GULF BUILDING, PITTSBURGH, PA.

clid trucks for haulage. By coordination of these quarry items it was said that rock could be produced for a direct cost of 29 cents per ton. This was based on a test run of 32,560 tons of rock produced.

To produce oil from this rock for competition with other sources of oil, large daily tonnages are indicated. The richer shales will produce 30 gal. per ton. These zones are estimated to contain 100 billion bbl. of recoverable oil. To produce 1,000,000 bbl. of oil per day at 50 gal. per bbl., some 1,600,000 tons of rock would have to be quarried per day.

Riprap Production

Mechanical handling of riprap has received considerable study by producers during the year. In the November, 1951, issue, page 83, was described the use of a forked dozer blade mounted on standard tractor equipment so that the unit screened, and literally sifted out, the fines before loading the larger stone to trucks. The scheme has considerable merit and the plan can be studied by shippers of riprap, even for jetty stone. In the June, 1949, issue, page 106, was described the mechanical method used to produce riprap at a plant in Kansas. It involved the use of a 5- x 14-ft. single-deck Simplicity riprap screen having 14-in. square perforations. The deck was 1¼-in. manganese steel plate, and the stone produced was minus 150 lb. In the August, 1951, issue, page 174, another mechanically handled riprap problem was covered. This plant is in Arkansas and used a Robins scalping grizzly from which stone between 50-3000 lb. was being shipped. A fourth riprap plant was described in the October, 1951, issue, page 107. This covers an operation with modest sized stone being processed over an Allis-Chalmers scalper and a stationary grizzly after first being crushed in a 42- x 50-in. Nordberg jaw crusher and a 14-in. A-C gyratory. A fifth riprap plant using an F-900 Tyler Ty-Rock screen as the heart of the operation was briefly described in the October, 1951, issue, page 103. The two plants mentioned last are in South Dakota.

Several of the newer Kue-Ken Gyracones have been put into operation. Those observed were about 18-in. opening and were doing an excellent job in exacting work in relatively small capacity plants.

During the past year production of lightweight aggregates has been growing in importance. New plants in Tennessee and North Carolina went into operation, and most of the older plants added an additional kiln or two. Two new plants in the Kansas City, Mo., area are scheduled to go into operation possibly by the time this is published. Both of these plants are being built by coal mining companies. In the June, 1951, issue, page 103, and in September, 1951, page 94, were described two lightweight aggregate operations that stemmed from coal wastes. The former used rotary kilns and the latter a Combustion Engineering Co. traveling grate. Most of the older plants use rotary kilns, some 60 ft. long, but one of the newer plants will use 125-ft. kilns. Two of the newer plants use the Dwight-Lloyd sintering technique.

Texas is one of the largest lightweight aggregate producing states in the country and the tonnage produced there is claimed to be equal to all the rest of the United States production. The wide and steady growth of the lightweight aggregate industry in Texas is attributed in a large degree to ready acceptance of the material by ready-mixed concrete producers.

In the newer plants dust control has taken an important role. In one operation wet Roto-Clones are used so that the dust recovered can be added to current agricultural limestone. There appears to be a need for a small capacity, low installation cost, wet, fine grinding and classifying system so that small crushed limestone producers can make and process a manufactured sand. Limestone sands have not been widely publicized and, as a result, some producers and consumers are skeptical of their merits. We wish to point out that some of the important dams in the United States (Bull Shoals, for example) were built using limestone sand (ROCK PRODUCTS, June, 1951, page 78).

In northern Michigan, according to reliable reports, a large copper mine pumps considerable water from its lower workings. Crushing is evidently done underground, so a continuous and automatic feeder device has been installed and the crushed stone is pumped out of the mine with the water. The process is said to be patented and will be exploited, so aggregate producers may have available another pumping system.

Contribution of Seismograph

(Continued from page 151)

ords obtained at points "a" and "b" of this curve.

It might be added that the operator of this quarry was not particularly desirous of increasing the size of his blasting operations. With a small but efficient quarry staff, he was able to maintain production levels ample for his needs, provided he was permitted to continue his 3-hole blasting schedule. The intelligent presentation of the actual vibration facts was successful in removing the serious threat of downward revisions in the provisions of the city ordinance.

Case B. This case concerns the vibratory effect upon a sparsely settled community located nearby an otherwise remote blasting operation. For the most part, this community consists of a scattered assortment of dwellings all of which are poorly constructed, badly maintained and in a general ramshackle state. One of the prime objectives of the tests was determining the closest safe distance at which blasting could be conducted with reference to some of the buildings. The situation was further complicated because some of the buildings were in a virtual state of collapse. In such cases, neither the known damage limits or ordinary precautions seemed to apply. Company officials were fearful least they be confronted with personal injury or fatalities and were giving serious consideration to the purchase of borderline property so as to insure full recovery of the product being mined.

The seismograph measurements were conducted from a distance of 1200 ft. from the shot point. The test data disclosed that blasts of 2500 lb. explosive charge could be fired with no greater vibratory effect than from a 400 lb. blast, furthermore, that the blasting could encroach within 500 ft. of buildings with safety. This last fact rendered it unnecessary to acquire additional property.

It should be noted from Fig. 2 that the vibration amplitudes rose and fell sharply for explosive loadings between 400 and 2500 lb. with maximum effect occurring for blasts of 1300 lb. The seismograms accompanying Fig. 2 refer to points "a" and "b" on this curve.

Case C. Production versus time was vital in the operations schedule at this quarry. The nature of complaints from a town one-mile away threatened to interfere seriously with maintaining desired schedules. The seismograph tests showed that explosive charges of 27,500 lb. were of equal effect to those of 13,500 lb. This information enabled the producer to employ blasts productive of sufficient tonnage to make on-time delivery and thus to avoid incurring contractural penalties. The seismograph measurements were made from a position 3900 ft. distant. The seismograms accompanying Fig. 3 are those of records obtained at points "a" and "b" on this curve. Here too, the in-between blasts rose and fell sharply, with the maximum occurring at 21,500 lb.

Conclusions

While the purposes of the cases reported above were devoted to objectives peculiar to their individual needs, nevertheless, it was from the multiple test data provided by these and other similar surveys that the vibration dip trend was revealed. This has resulted in the undertaking of new projects, the sole purpose of which is the study of this dip under highly controlled conditions.

The seismograph has shed the role of a "gadget," useful only in the arbitration of blasting damage claims and lawsuits, and demonstrated its worth as a full-fledged industrial tool. When employed in this capacity, the seismograph is destined to make further economic contributions to the quarry industry.

4-wheel drive PAYLOADER®

Palmetto Quarries takes tons of tough, stubborn granite from its Columbia, South Carolina quarry. With two large electric shovels and a fleet of 15 ton trailer trucks to keep moving, there are lots of chores for its 1½ yd. Model HM "PAYLOADER" tractor-shovel . . . there's clean-up around the shovels, starting and pushing stalled trucks, building and maintenance of roadways, loading odd lots of rock, cleaning-up around conveyors, and many other jobs.

This 4-wheel-drive "PAYLOADER" replaced a big crawler tractor and the management cites the following benefits: (1) does all the work the tractor did (2) gets around faster (3) shows savings in operation cost over tracks (4) provides an additional loading tool and (5) the tractor operator is much happier.

Model HM's are helping quarry and pit operators all over the country to increase production and reduce costs. You are invited to find out how "PAYLOADERS" can help you too. The Frank G. Hough Co., 705 Sunnyside Avenue, Libertyville, Illinois.

WRITE for catalog on the 1½ yd. Model HM or the six other sizes of "PAYLOADERS" down to 12 cu. ft. bucket capacity. There's no obligation.

SAY "HUFF"

PAYLOADER®

THE FRANK G. HOUGH CO. • Since 1920

New "Packaged Unit" designed for aggregates, coal, coke, ores and other bulk materials

Equally applicable for both small or large scale operations, the new Hewitt-Robins Sectional Belt Conveyor is a packaged unit that can be assembled by your own workmen—and in considerably less time than required for conventional type conveyors.

From the variety of truss sections, head sections and A-frame supports you can select a conveyor system suited to your needs—in length, height, belt width and capacity. And, when you change locations, the conveyor can be disassembled, with sections added or dropped to suit conditions at the new site.

Like all Hewitt-Robins machinery, this new Sectional Belt Conveyor is carefully designed, strongly constructed. It is equipped with world-famous Robins Troughing and Return Idlers with one-shot lubrication. Curved decking protects the return strand of the belt.

And remember, only Hewitt-Robins is able to take single, unified responsibility for a successful Belt Conveyor installation —machinery and belting. For complete information on the new Hewitt-Robins Sectional Belt Conveyor, write today for Bulletin No. 132. Address Robins Conveyors Division, 270 Passaic Avenue, Passaic, N. J.

* * *

HEWITT-ROBINS SECTIONAL BELT CONVEYOR HEAD SECTIONS—3 types of drives to take motors from 2 hp to over 40 hp. Terminal pulleys (both head and tail) are solid welded steel with cast iron hubs.

TRUSS SECTIONS—2 designs—24" deep in lengths of 6'6", 15'6", 18'6", and 21'6"; 42" deep for greater spans. Side members all-welded construction; diagonal bracing members have jig-drilled holes for quick field assembly.

BENT SUPPORTS—A-frames are available in complete range from 4' to 50' deep—easily erected.

BELT WIDTHS—18", 24", 30" and 36". Lengths up to belt limitation.

HEWITT-ROBINS

BELT CONVEYORS

HEWITT-ROBINS HR **INCORPORATED**

BELT CONVEYORS (*belting and machinery*) • BELT AND BUCKET ELEVATORS • CAR SHAKEOUTS
DEWATERIZERS • FEEDERS • FOAM RUBBER PRODUCTS • FOUNDRY SHAKEOUTS
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RUBBERLOKT ROTARY WIRE BRUSHES • SCREEN CLOTH • SKIP HOISTS • STACKERS
TRANSMISSION BELTING • VIBRATING CONVEYORS, FEEDERS AND SCREENS

(Continued from page 175)

****The C. S. Johnson Co.**
Booths 90-91
A ¾-cu. yd. clamshell bucket and photographs of equipment.

***Johnson-March Corp. Booth 116**
Photographs of typical J-M dust control installations in various types of crushing plants.

***Joy Manufacturing Co. Booths 28-29**
Complete line of hand-held rock drills; also a display of electrical connectors manufactured by the company as well as a photographic display of other Joy equipment: Champion blast-hole drills, portable and stationary air compressors, wagon drills, and Joy Hydro drill jibs.

***Kennedy-Van Saun Mfg. and Eng. Corp. Booth 50**
Enlarged photographs of recent equipment installations.

****Kensington Steel Co. Booth A**
Oro alloyed manganese steel elevator chain and shovel and crusher repair parts. Also new heavy-duty pintle type elevator chain and renewable tooth sprockets.

****Koehring Co. Booths 92-93**
Colored pictures of clamshell cranes and Dumptors.

***LeRoi Co., Cleveland Rock Drill Div. Booths 125-126-127**
New T286 self-propelled dual drill rig, 600 c.f.m. Airmaster air compressor, and a Tractair (combination 35-hp. tractor and 105-c.f.m. compressor) with a lightweight mounted wagon drill.

****Link-Belt Co. Booths 57-58**
Samples of belt conveyor idlers, elevator chains, sprockets, ball and roller bearings and other power transmitting equipment on display. Illustrations of installations.

Link-Belt Speeder Corp. Booths 122-123
Operating scale model of a "Speed-o-Matic" controlled machine, alternating each day as a shovel or dragline.

Littleford Bros., Inc. Booth 87B
"Kwik-Steam" vapor generator.

****Ludlow-Saylor Wire Co. Booth 100**
Variety of samples of industrial wire cloth and screens, particularly Super-Loy screens.

****Mack Motor Truck Corp. Booths 13-14**
END672 diesel engine, a four-stroke cycle, 672-cu. in. engine, will be featured; types of power dividers.

****Marion Power Shovel Co. Booths 131-132-133**

Marquette Cement Manufacturing Co. Booth M-20
Background map showing company's marketing area and location of its shipping and producing plants in the area, along with product samples from each of the plants.

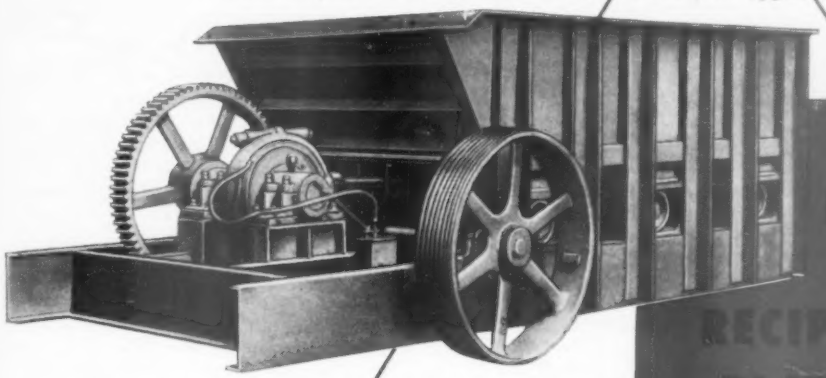
The Master Builders Co. Booths L-7, L-8, L-9
Demonstration of results obtained with the use of Pozzolith.

****McLanahan & Stone Corp. Booth 111**
Backdrop with illuminated pictures and models of crushers and washers.

A Great Combination..

For Low Cost Handling and Crushing Operations!

A combination of McLanahan Reciprocating Plate Feeder and Rockmaster Crusher is your answer to most economical feeding and crushing of 1000 tons or more of limestone, ore or rock per hour. Equipment can be furnished as component parts or as separate units to best suit your application.



1

McLANAHAN

Heavy Duty

RECIPROCATING

PLATE FEEDER

Built to handle materials from the size of sand to shovel-loaded rock, McLanahan Adjustable Reciprocating Plate Feeders automatically control the rate of flow of material, and are quickly adapted to the producing capacity of any machine.

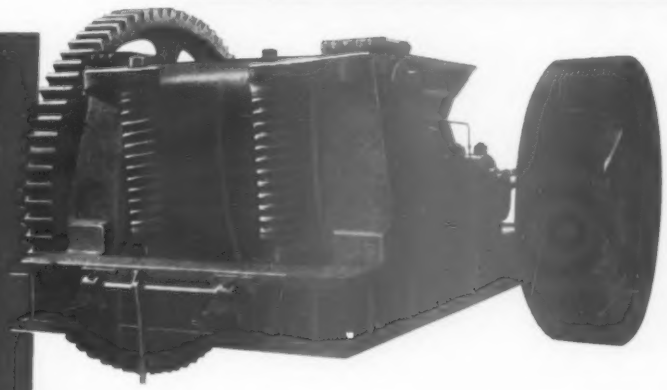
2

McLANAHAN

Single Roll

ROCKMASTER

CRUSHER



The McLanahan Rockmaster Crusher is the economical solution to most any crushing problems. Greatest savings can be achieved by this combination of equipment. Outstanding for primary and secondary crushing operations, for use on limestone, gypsum, rock, gravel, shale, iron ore, slag and other materials.

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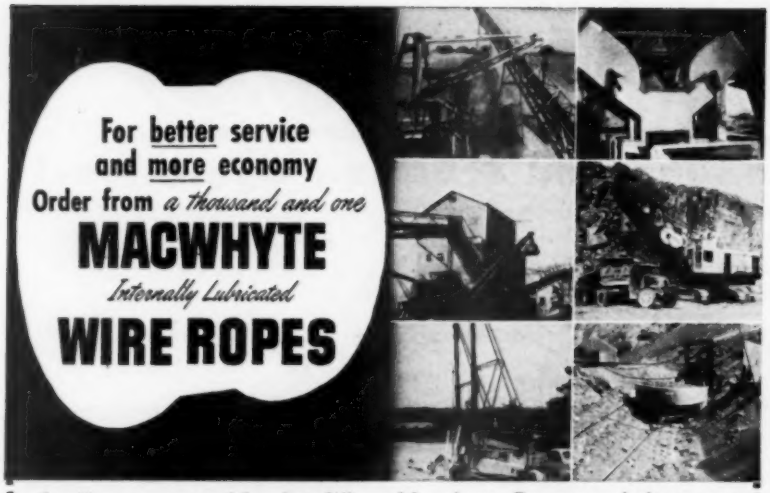
Dependable Products: **Single and Double Roll—and Jaw Crushers, Crushing Plants, Reciprocating Plate and Apron Feeders, Roll Grizzlies, Conveyors, Elevators, Screens, Scrubbers, Steel Log Washers, Sand Drags, Hoists, Jigs, Dry Pans, Dryers, Scrap Bundlers, Pulleys, Gears, Bearings, Sprockets, Sheaves, Rollers, Bin Gates, Elevator Buckets, Gratings, Car Wheels, Ferrous and Bronze Castings.**



It will pay you to get Macwhyte Wire Rope engineered and job-proved for your equipment. Over the years, ropes for all types of quarry equipment have been developed by Macwhyte. Recommendations are promptly available from Macwhyte distributors or Macwhyte Company. You get the correct wire rope for your equipment when you buy Macwhyte.

MACWHYTE COMPANY

2949 Fourteenth Avenue, Kenosha, Wis. Manufacturers of Internally Lubricated PREformed Wire Rope, Braided Wire Rope Slings, Aircraft Cables and Assemblies, Monel Metal and Stainless Steel Wire Rope. Catalog available on request.

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TYPE "T" PUMPS for
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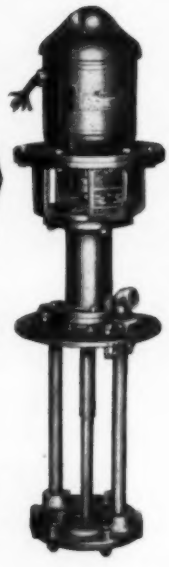
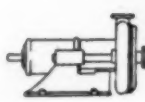
Sand Transfer
Small dredging operations
Seal water service for dredge pumps

TYPE "SW-O" PUMPS for
Spillage
Drainage
Circulating wash water



Ask for names of sand and gravel companies using Nagles and a copy of Catalog 4906



Nagle Pumps, Inc.

INDUSTRIAL PUMPS FOR ABUSIVE APPLICATION

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W. R. Meadows, Inc. **Booth L-2**

Medusa Portland Cement Co. **Booth M-8**

Pictures showing the results obtained by using cement paint and rubber base floor coating.

***Murphy Diesel Co.** **Booths 48-49**

Photographs and cutaways of diesel engines and generator sets, and a slide projector showing various methods used in installations.

****Nordberg Manufacturing Co.** **Booths 30-31-32**

Symons V centrifugal screen, a 30-in. Symons intermediate cone crusher, and two four-cycle type 4FS3-DE diesel engines with centrifugal pump attachment and type 4FS2-BE with clutch power take-off.

***Northern Blower Co.** **Booth 63**

Representative pictures of various types of installations and a few representative pieces of equipment used in dust collectors.

****Northwest Engineering Co.** **Booths 125-126** ***Booths 119-120-121**

Backdrop of pictures of installations.

***Olin Industries, Inc., Western Cartridge Co. Div.** **Booths 10-11**

Display of blasting caps and dynamites.

****Osgood Co.** **Booth 118** ***Booth 122**

Model of the first two-horse Osgood excavator, built in 1852; photographs of modern machines on the job.

****Pettibone-Mulliken Corp.** **Booth 83**

****Pioneer Engineering Works, Inc.** **Booth B**

Complete crushing and screening plant in operation, ¼ scale, consisting of feeder, primary jaw crusher, two-deck vibrating screen and triple-roll crusher, connected by miniature conveyors.

****Pit and Quarry** **Booth M-15** ***Booth 98**

***Quaker Rubber Co.** **Booth 123**

****Rock Products** **Booth M-3** ***Booth 94**

***John A. Roebling's Sons Co.** **Booth 128**

Special samples of woven wire screens: Roeflat scalping screens, Roeton dewatering and sizing screens, Roeslot production screens and Roecrimp sizing screens.

***Sanderson-Cyclone Drill Co.** **Booth 129**

Sauerman Bros. **Booth 94**

Model slackline cableway and model roller-bearing cableway hoist; action pictures showing rapid-shifter scraper.

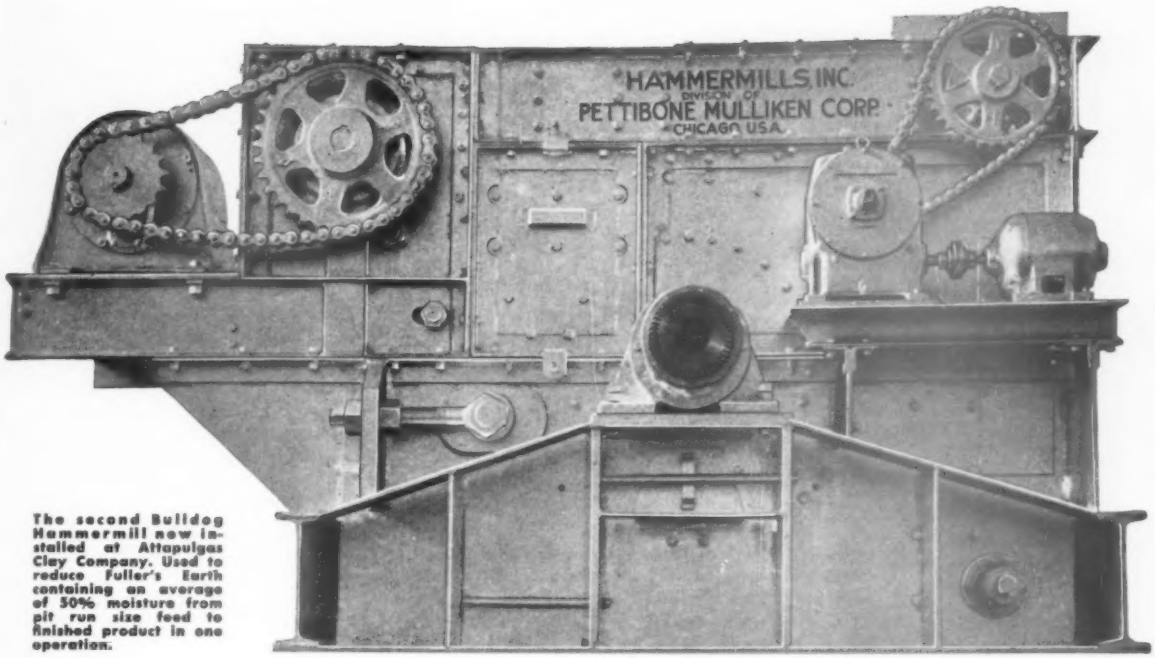
Scientific Concrete Service Corp. **Booth 1**

Methods used for control of concrete quality on display.

****Screen Equipment Co., Inc.** **Booths 2-3**

A 3½-deck Seco screen.

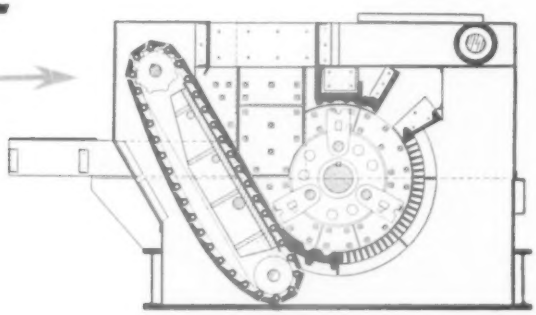
Servicised Products Corp. **Booth M-4**



The second Bulldog Hammermill now installed at Attapulgus Clay Company. Used to reduce Fuller's Earth containing an average of 50% moisture from pit run size feed to finished product in one operation.

BULLDOG HAMMERMILL

with Moving Breaker Plate →



For wet, sticky material reduction . . . for those tough, heavy-duty crushing jobs.

Illustrated above is the last word in Moving Breaker Plate Hammermill design. It is built by an engineering organization whose experience far surpasses any organization that might furnish Moving Breaker Plate crushing equipment.

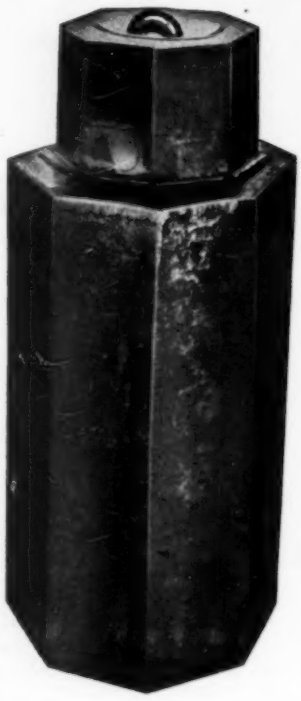
Design Improvements have increased reduction efficiencies and lowered H.P. requirements. You can see this equipment in operation at any time. Also Hammermills will gladly survey your reduction requirements and recommend the proper equipment without cost or obligation. Just write or call.

Bulldog Hammermills are built in capacities up to 1000 tons per hour for every purpose: for primary, secondary, fine reduction of materials such as limestone, shale, Fuller's Earth, phosphate muck, phosphate mud balls, iron ore, oyster and clam shells, any reducible material.

HAMMERMILLS, INC., division of **PETTIBONE MULLIKEN CORPORATION**

4773 W. Division St. **Chicago 51, Illinois** **Phone SPaulding 2-9300**

More Tonnage



"Cape Ann"
Forged
Steel Drop Ball

Ruggedly designed and drop tested to insure maximum breakage. Lifting link protected by deep recess to minimize cable replacement. Adaptable for swivel or shackle.
Used by leading quarries for *economical secondary breakage.*

2000 to 8000 lbs.

Prompt Shipments

For further information write—

Cape Ann Anchor & Forge Co.
Post Office Box 360
Gloucester, Mass.

Sika Chemical Corp. **Booth M-22**
Plastiment, a chemically retarding densifier for concrete and mortar, will be shown.

****Simplicity Engineering Co.** **Booths 95-96-97**
Operating two way Os-A-Veyor inertia-type feeder; Simpli-Flo two-bearing type screen, 3- x 6-ft. two-deck; display panel with illuminated pictures of different equipment.

****Smith Engineering Works** **Booths 42-43**
Display of scale models of a jaw crusher, Gyrasphere crusher, apron feeder, Vibro-King screen and Super Scrubber.

The T. L. Smith Co. **Booths 47-48-49-64-65-66**
A 5½-cu. yd. mixer mounted on a White tandem axle truck.

Solvay Sales Div., Allied Chemical & Dye Corp. **Booth L-4**
Calcium chloride literature, material samples and an automatic slide presentation of the use of calcium chloride in ready-mixed concrete.

****Stedman Foundry and Machine Co., Inc.** **Booths 18-19**

****Stephens-Adamson Manufacturing Co.** **Booth 124**
Conveyor section on display, showing carriers, holdbacks, belt cleaners in operating position.

Sturtevant Mill Co. **Booth M-18**
Air separator and laboratory crushers featured in large photographs.

SuPremix, Inc. **Booths M-5, M-6**
Scale model of packaged central-mixing plant, illustrating tilt-up mixer.

Symons Clamp & Manufacturing Co. **Booth M-9**
New plywood forms backed with steel cross members; new outside steel corner form; miniature scale model of a 40- x 40-ft. foundation form complete with bracing and scaffolding.

****W. O. & M. W. Talcott, Inc.** **Booth 20**
Complete line of belt fasteners for splicing conveyor and transmission belts.

****Taylor-Wharton Iron and Steel Co.** **Booth 101**
Set piece of photographs of various Tisco manganese steel castings.

****Thew Shovel Co.** **Booth 70-71**

***Torrington Co., Bantam Bearings Div.** **Booths 107-108**
Display of anti-friction bearings, including self-aligning spherical roller bearings used in most construction machinery.

Transmission & Gear Co. **Booths 15-16**
New design mixer, the "Load Champion" with direct drive transmission; also 4½-cu. yd. deluxe model Transo truck mixer.

***Traylor Engineering & Manufacturing Co.** **Booths 61-62**
Series of photographs of equipment.

****The W. S. Tyler Co.** **Booths 8 and 25**
New Ty-Electric heated Ty-Rock screen for damp screening; samples of Tyler woven wire screens along with a Ro-Tap testing sieve shaker and standard screen scale testing sieves.

Union Wire Rope Corp. **Booth M-10**
Samples of line of Tuffy slings and Tuffy wire ropes on display.

****The White Motor Co.** **Booths 47-48-49-64-65-66** ***Booth 117**
Model WC2264 six-wheel tandem axle chassis on which is mounted a Telsmith 5½-cu yd. mixer.

Charles E. Wood Co. **Booth M-17**

Worthington Pump and Machinery Corp. **Booths 10-11-12-21-22-23**

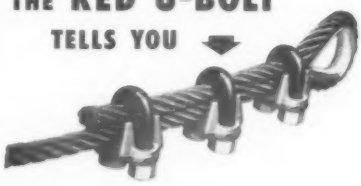
New Headquarters

HARRY T. CAMPBELL SONS' CORP., Towson, Md., has opened new offices in its own Campbell Building, 100 West Pennsylvania Ave., Towson 4, Md.

Sells Quarries

ANNVILLE STONE CO., Hershey, Penn., has sold 154 acres of land on which is located its quarries and plant to Michigan Limestone and Chemical Co., Detroit, Mich. Revenue stamps indicated a transaction of $700,000.

THE **RED U-BOLT** TELLS YOU



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4. *They're America's largest-selling* **DROP-FORGED** *WIRE ROPE FASTENERS*

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AMERICAN HOIST & DERRICK CO.
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"QUICK-WAY"

Reg. U.S. Pat. Off.

Speeds Output Increases Profits for ROCK PRODUCT OPERATORS

Whether its moving shot rock, sand, or crushed stone, stripping overburden or charging bins, you'll find the "QUICK-WAY" in a class by itself in the ¼ to ½ yard field.

The "QUICK-WAY" features low center of gravity, works easily over the side, has proper balance for truck operation, gives you easy, fast swinging, plenty of reserve power, rugged all steel construction, numerous parts interchangeable. 4 models, ¼ to ½ cubic yard shovel, clamshell, dragline, backhoe, 3 to 10 ton crane capacity. Truck speeds to and from jobs. Low initial cost. Low maintenance costs. Eight different attachments.

With a "QUICK-WAY" you'll roll up yardage records hour after hour, day after day. Ask your distributor for a free demonstration or mail coupon.

Clinker is handled from the pit to the storage pile and from the storage pile to grinding circuit with a mobile "QUICK-WAY" crane

"QUICK-WAY" Model E dragline with 30' boom loading gravel

"QUICK-WAY" truck shovel, loading sand

"QUICK-WAY" crane with skull cracker attachment eliminates secondary shooting

"QUICK-WAY" TRUCK SHOVEL CO.
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"QUICK-WAY" TRUCK SHOVEL CO.
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Please send me complete details on "QUICK-WAY" Truck Shovels —four different models from 3 to 10 ton crane capacity.

Name _____

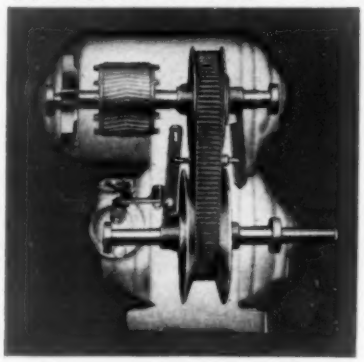
Address _____

City _____

50% Greater Concrete Strength Achieved

The Yoder Company of Cleveland, Ohio, reports Sterling Speed-Trol, powering their revolutionary Continuous Concrete Mixer, gives the variable speed control necessary for continuous, accurate proportioning and mixing which made development of this machine possible. Compared to batch mixers, the Yoder Mixer increases concrete strength 50%, increases production at lower cost, and reduces equipment and maintenance costs over 50%.

STERLING SPEED-TROL



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(Continued from page 109)

area are not anticipated. Undoubtedly the shortage of steel will slow down bridge construction in 1952 and may seriously affect a great part of our construction program.

"In our opinion, asphaltic concrete and portland cement concrete pavements both have their place in highway construction. We make constant use of both and intend to continue doing so."

Delaware: "The outlook for highway construction in this state for 1952 is generally favorable. We anticipate the largest construction program ever undertaken by the state.

"Shortages of cement and steel will handicap the construction program. It is anticipated, however, that sufficient cement will be available for most of our construction. While the lack of steel will be a drawback, it is likely that those jobs requiring it will be shoved further back on our program.

"Our specifications do give increasing consideration to the use of granular subbases. Since 1945 it has been our practice to provide a granular subbase for all primary or secondary roadways regardless of type. It is our opinion that this practice has already shown the wisdom of this decision."

Pennsylvania: "We are proceeding with a state highway construction program in 1952 in excess of our construction program for 1951. In 1951 we spent approximately $100,000,000 for construction, reconstruction and resurfacing of the state highway system. We expect to expend $110,000,000 in 1952.

"We have been seriously handicapped in Pennsylvania in completing projects due to a shortage of structural steel. This situation continues to exist and so far we have been allocated only 20 percent of our actual requirements for 1952. We are hoping that the restrictions may be modified so that we can proceed with our program in a more normal manner.

"It has been and will continue to be our policy to construct foundations, abutments and piers on all bridges and place the superstructure as rapidly as steel may become available. There has been no shortage of cement in Pennsylvania which has affected our program.

"We have been using a granular subbase under our pavements in Pennsylvania for the past several years and will continue this practice."

Montana: "Our construction and maintenance program for calendar 1952 will approximate that of 1951. Gasoline taxes, the real barometer of our potential program, are 10.34 percent ahead of our budget requirements.

"Shortage of steel, the future of which cannot be prophesied, is extravagant with time. The cost, due to this shortage, is impossible to estimate."

North Dakota: "North Dakota is proceeding with its proposed 1952 construction program in the usual manner. Its volume of work is expected to compare favorably with that of other recent postwar years. This has amounted to about $9,000,000 annually.

"Based upon current information, no serious cement shortage is anticipated.

"Delays in the delivery of structural and reinforcing steel may interfere with the progress on some projects. However, priorities are promptly applied for and the exercising of some expediting work thereafter is expected to keep this interference as low as possible under prevailing conditions.

"Granular subbases have been in standard use in this state for several years for both rigid and flexible type pavements."

Massachusetts: "For the past two years this department has been engaged in the largest highway program ever authorized in Massachusetts. We expect this high level of highway construction to continue through 1952 provided it is not curtailed by governmental restrictions or materials shortages. However, the sums to be available for expenditure for the fiscal year beginning July 1, 1952, will be determined by the 1952 legislature and cannot be predicted.

"Serious shortages of cement and steel would definitely curtail the program. I am not in a position to predict how serious such shortages may be."

New York: "We are hopeful that adequate funds will be made available to permit vigorous progress of the huge task of rehabilitating the highway system. New York throughway construction should be greatly accelerated and will be characterized by the undertaking of work in several new areas, and the further extension of portions which are under construction or opened to traffic. Strong emphasis will also be placed upon progressing the urban arterial route program in an ever-increasing number of New York cities. Insofar as possible, projects will be advanced on a priority basis determined by conditions which were revealed in the Cooperative Highway Needs Study and subsequent surveys.

"Shortages of steel have greatly retarded the highway construction program. Unless unforeseen conditions lead to federal regulation of the use of cement, it is not expected that our work will be handicapped by shortages of this material. It is realized that in some instances it may be necessary to modify designs and to make substitutions in order to carry on the work. Continued restrictions on steel may make it virtually impossible to proceed much further with first phase grading projects because of the limited extent to which this type of work may be progressed without the construction of necessary drainage fa-

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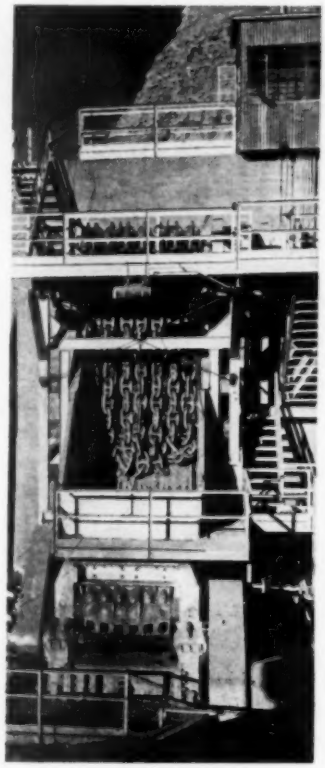

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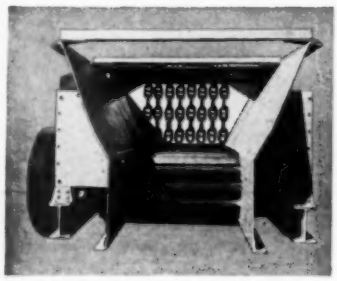

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"The shortage of steel has already severely handicapped the construction of bridge projects in this state, and it is expected that conditions will become worse next year.

"Subgrade materials throughout most of South Carolina are generally satisfactory without extensive treatment. Greater attention, however, is being given the proper compaction of the subgrade, and our specifications provide for the minimum density to be obtained."

A Midwestern state: "For the calendar year 1951, our department of highways will have sold by the end of the year highway construction projects totaling approximately $55,000,000. The prospects are that our highway construction program for 1952 will considerably exceed this figure since in addition to the normal highway construction we expect to sell several large urban projects. I will not attempt to hazard a guess as to what the total might be, but it should be considerably in excess of $55,000,000.

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Labor Relations Trends

(Continued from page 81)

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Lime Calcination

(Continued from page 139)

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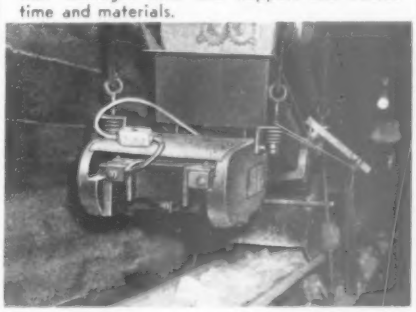

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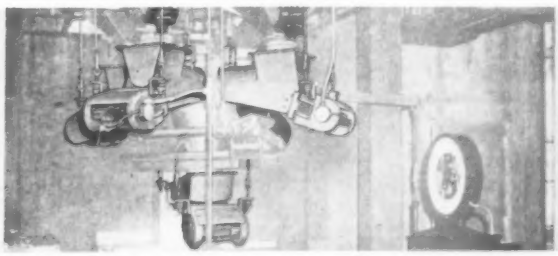

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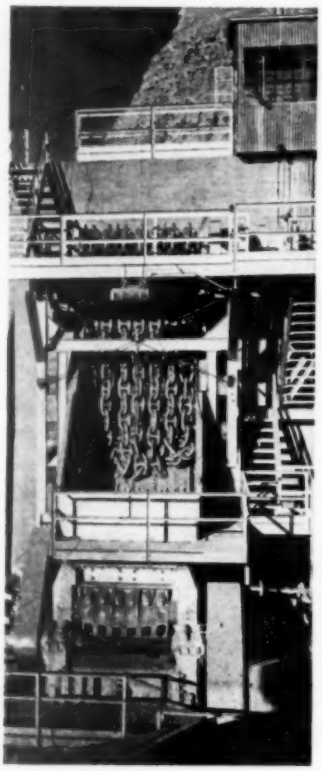

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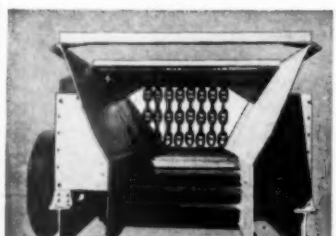

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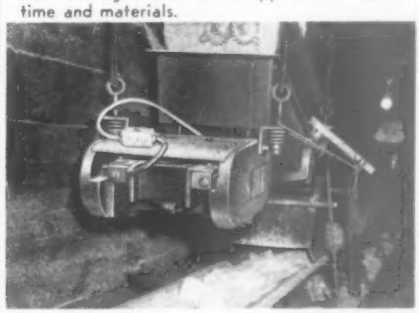

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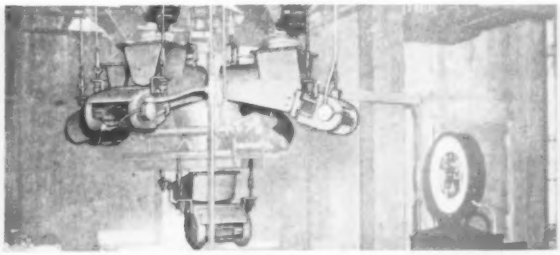

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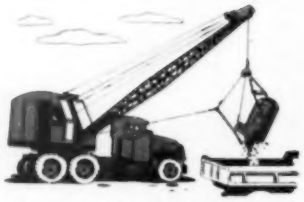

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flame. Injecting the hot air by fan solves the technical problem, but at a cost of operation and the use of cumbersome equipment.

The simple external rotary cooler has been largely used in the past and is still used in many plants. They are quite ineffective in good preheating of the air. They fail to do a good job of cooling the lime, and much of their effectiveness is due to their own radiation rather than the regenerative heating of the air. They are apt to pick up dust unless properly designed and well maintained. It is difficult to control the air flow for properly distributed combustion, unless special fan injection of the air is used. They must be considered as obsolescent, although doing a fractional regenerative job.

Finally we have the Unax or planetary type of cooler, consisting of a plurality of smaller cylinders mounted on and rotating with the kiln. There are a number of this type in service with varying degrees of success. A criticism of them as now marketed is insufficient size for lime. They were developed for cement, a clinker which cools quickly because of its density. For lime, a much larger cooler is necessary to give the requisite time for slow cooling. Lighter construction can be used because of the less abrasive nature of lime, and its lower temperature and slow rate of cooling. Better heat exchange must be developed.

These coolers have the great advantage of cheapness and simplicity. They counterflow the air and lime and, being rotary in their nature, take the lime produced irrespective of quantity, sizing and grading.

Aside from the above mentioned defect of needing means of better heat exchange and insufficient size, there is the basic defect of too much radiation surface. A few desultory efforts have been made at insulation, but no consistent work has so far been done to overcome this defect. There is considerable difficulty in accomplishing this because of the weaving of the rotating coolers and differential thermal expansion troubles. But the successful solution of this problem should make an important contribution to fuel efficiency.

It must be fully realized that any heat lost below the point of initial calcination is valuable high level heat, good for calcination. This is true no matter how low the temperature of the lost heat is at the discharge end. Everything possible should be done to conserve heat at the discharge end of the kiln and in the cooler.

We still erroneously think of coolers as coolers rather than heat regenerators. But when they do their cooling by radiation, they are losing valuable high level heat. It must be forcibly reiterated that any heat loss at the discharge end of the kiln is valuable high level heat. So it may be considered as axiomatic that any un-

pleasant heat at the firing end of a kiln is a costly heat loss.

Even in an inefficient kiln, it is possible to raise the temperature of the air of combustion to 500 deg. F. If the air is raised to this point, it will no longer be an inefficient kiln. An efficient kiln can raise the temperature higher. And this higher temperature is a big step to the pay temperature of 1500 deg. F. where calcination begins. The percentage of high level heat is greatly increased. The stack temperature is reduced.

Engineers have long recognized this principle, but the practicalities of simple operation have prevented important progress. Now the increased and increasing cost of fuel is making managers cognizant of the problem and its solution. Progress is being made, and it is anticipated by this writer that there will be much progress in the next few years.

Flotation Review

(Continued from page 169)

only do we obtain potash from underground beds of mixed salts but also from solar evaporated salts contained in the brines near Bonneville, Utah. This operation combines vast areas of evaporating ponds with unique methods of pumping and transferring brines in various stages of evaporation to obtain a crystalline mixture of KCl and NaCl. The mixed salts are then separated by grinding and are concentrated by froth flotation.

Pegmatite Minerals

The separation of feldspar from quartz has relieved an entire industry of complex underground operation with the many attending labor requirements. Vast pegmatite reserves are being tapped to produce high quality, uniform feldspar concentrates for both the glass and pottery industries.

More exacting specifications of the industries using feldspathic material made concentration a necessity. Requirements such as 0.02 percent Fe to 0.10 percent Fe as maximum allowances gradually made it attractive to replace selective mining methods by froth flotation methods which can easily utilize lower grade crude ores to produce not only an exceptional feldspar concentrate but can also produce a mica concentrate for roofing paper, paints, pigments and fillers, an iron concentrate rich in iron-bearing minerals such as garnet and at the same time produce a quartz concentrate containing a very low content of iron. Quartz tailings are available at below 0.02 percent Fe.

In addition to the mica-feldspar-quartz separation, new methods make possible such concentrates as spodumene from iron-bearing mineral, feldspar, beryl, cassiterite and other minor minerals.

Such separations bring into bearing all the ingenuity of the mineral engi-

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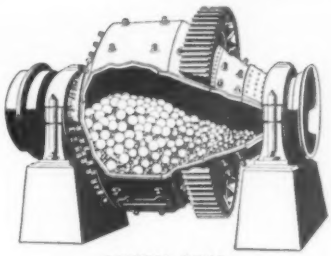
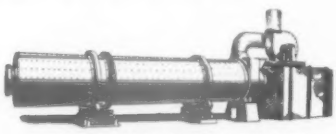
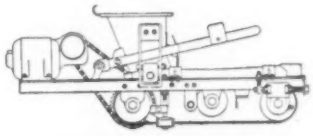
. . . plus Engineering "KNOW-HOW"



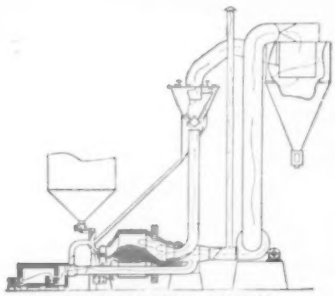
CONICAL MILLS
Bulletin 17-B-7



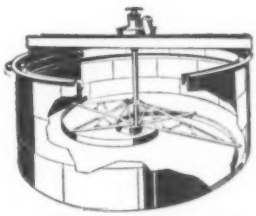
ROTARY DRYERS, KILNS, COOLERS
Bulletin 16-D-7



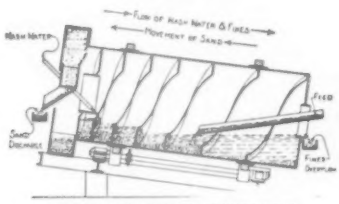
CONSTANT-WEIGHT FEEDERS
Bulletin 33-D-7



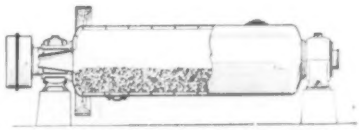
AIR CLASSIFYING SYSTEMS
Bulletin 17-B-7



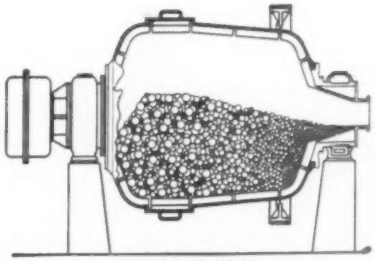
THICKENERS, CLARIFIERS, FILTERS
Bulletin 35-C-7



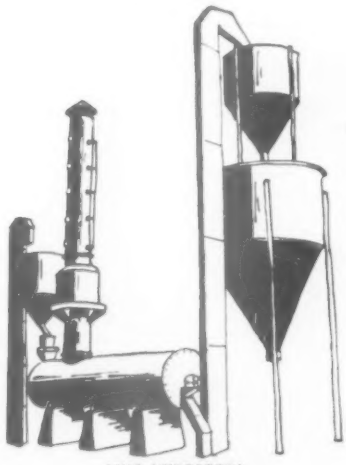
COUNTER-CURRENT CLASSIFIERS
SAND WASHERS
Bulletin 39-B-7



CYLINDRICAL, TUBE AND ROD MILLS
Write for Bulletin



TIRCONE MILLS
Bulletin AH-414-7



LIME HYDRATORS
Bulletin 49-7

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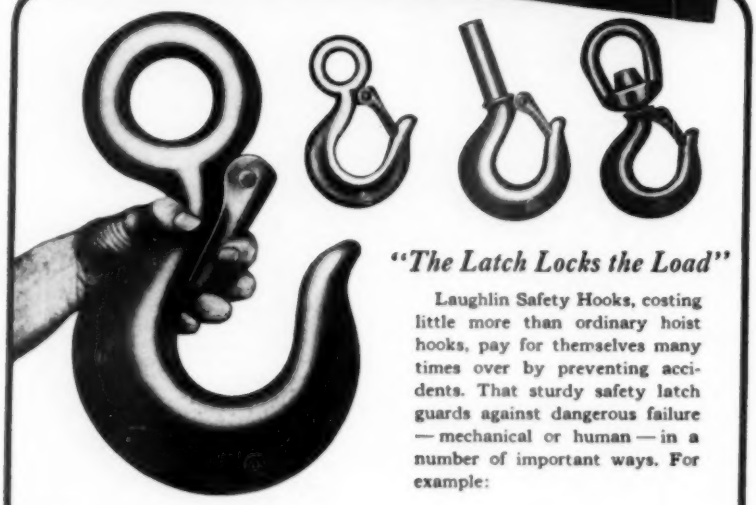

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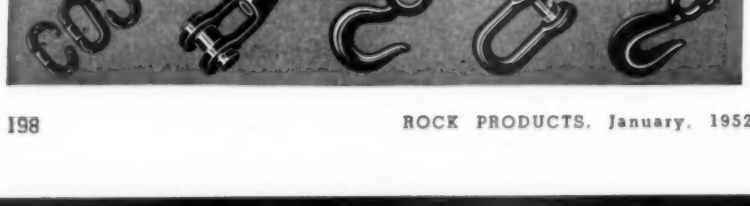


neer and require the use of froth flotation and gravity and electrical separation.

Glass Sand

A most recent trend is the treatment of sands for the glass and pottery industry. Transportation costs make it prohibitive to ship a low priced commodity for long distances if it can be obtained locally by the treatment of low grade sources by froth flotation.

This situation has forced a unique development and we now have plants in operation which produce the required quality silica sand and at the same time produce an acceptable feldspar concentrate and minor minerals from such inexhaustible sources as beach sands of both modern and ancient deposits.

There are also many deposits of silica which can be made very attractive if only a minor amount of iron in the form of stains or definite iron-bearing minerals can be removed. This needed separation is being easily accomplished by froth flotation alone or in combination with unique scrubbers which polish the silica surfaces clear of all cemented iron stains.

Nonmetallic Flotation Reagents

As so often happens, history repeats itself. The knowledge gained in one field of interest is transferred to another. Iron ore is desperately needed to supply the vast amount of steel going into our expanded domestic and foreign efforts.

With an end in sight to direct shipping of ores, more and more thought has been given to the concentration of intermediate or lower grade ores and waste tailings.

The knowledge gained in the phosphate industry is almost directly applicable to the concentration of minus 100-mesh wash ore tailings which have been and are still being impounded in the Mesabi range district. Even more fortunate is the fact that froth flotation experience in the nonmetallic industry can also be utilized to relieve this critical shortage.

New techniques which have passed through the pilot plant stage and may be developed in commercial units will soon require two entirely different flotation procedures The experience gained by floating silica with cationic high molecular weight aliphatic amines will be used to froth float silica from oxidized iron minerals such as hematite and limonite as they occur in washing tailings and possibly oxidized taconites.

The second procedure reverses the practice and utilizes anionic flotation reagents in the form of petroleum sulfonates or aliphatic fatty acids which are more generally used in nonmetallic mineral separations.

Possibilities Unlimited

Not only has froth flotation led the way toward better concentration methods for phosphate, potash, fluor-

spar, barite, feldspar, mica, quartz, silica sands, clay, spodumene, garnet, sillimanite, beryl, kyanite, talc, graphite, celestite, magnesite, cement rock, coal and iron ore, but it will continue to blaze a path to better nonmetallic mineral concentrates which play such an important part in the development of modern high temperature machines, such as jet and rocket planes, to the atomic power reactor itself.

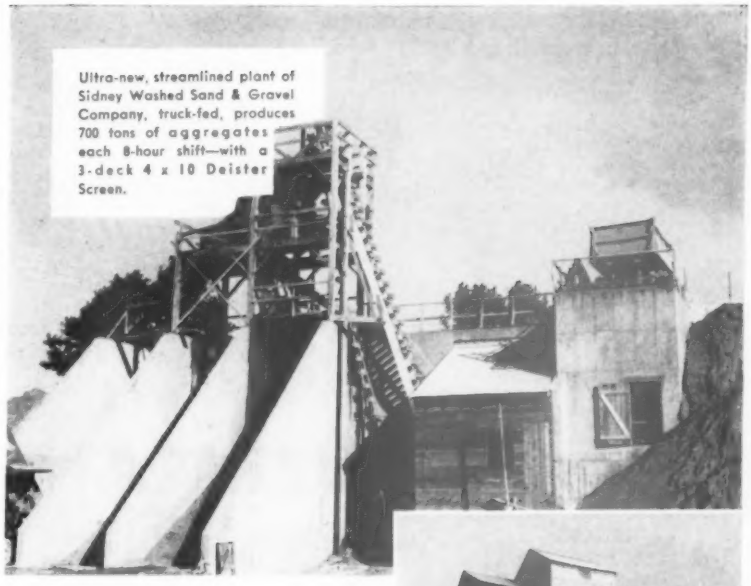
Portable Review

(Continued from page 163)

are so-called mobile mills for this purpose, but if HMS takes hold there may be possibilities of mounting such an assembly on rubber tires to transport to the place of use on tires and erect more permanently at the pit.

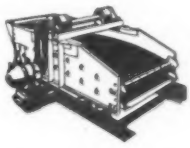
In the literature relating to portables, and from our own personal observations, a considerable amount of stress is placed on the tonnage sent through a set of crushers. If one was to take seriously some of the claims, no doubt world records would be shattered. Many of these claims are based on rock types with generic names that in one state can mean a hard rock, and in another state mean almost the opposite (marlstone, malopi, limestones, etc.). Size of crusher opening used is not often weighed against claims of high tonnage per hour. Maybe we are dead wrong in our reasoning. The cost of a set of relatively small crusher jaw wearing plates, in cents per ton, is a mighty small item compared to labor costs. And too many times we have seen all production stop and a considerable number of skilled and unskilled men begin the job of repairing or replacing some of the short-center belts that are a part of most portable plants. These short conveyors with short head and tail pulley radii are tough on belts, and when they fail the plant stops. On the other side of the picture a set of plates, even if worn badly, can usually be made to hold out until a week-end when repairs can be made without a gang of men standing around waiting for the plant to start.

A typical example of the flexibility of portable plants and the number of finished products they can produce is the unitized plant of B. L. Anderson, Cedar Rapids, Iowa. On one of his operations he produced four sizes of finished products averaging 210 t.p.h. His Cedarapids plant consisted of a portable primary with a 22- x 36-in. jaw crusher, a portable screening unit, a secondary crushing and screening unit with a 4033 hammermill and four portable bins. All primary crushing is handled by the portable primary. The screening unit scalped off all material $\frac{1}{8}$ in. and down for limestone dust and $\frac{3}{4}$ in. for Class A road rock used on county roads. All the oversize was then fed to the hammermill secondary unit that crushed and screened up to $\frac{3}{8}$ in. as one product and $\frac{3}{8}$ in. to $\frac{3}{4}$ in. for



Ultra-new, streamlined plant of Sidney Washed Sand & Gravel Company, truck-fed, produces 700 tons of aggregates each 8-hour shift—with a 3-deck 4 x 10 Deister Screen.

Long, trouble-free service by three Deister Screens in its old plant (still in use) led Sidney Company to buy Deister Screen for its new plant.



BOUGHT FOR THE NEW

Sidney Washed Sand and Gravel Company, Sidney, Ohio, equipped its new plant with a new three-deck 4 x 10 Deister Screen, to get 700 tons per 8-hour shift.

BECAUSE PROVED IN THE OLD

Sidney's old plant, still going strong, has THREE Deister Screens—a 30" x 48" single-deck scalper, two 3 x 6 three-deck, and a 3 x 10 single-deck. Capacity is 500 tons per day.

Plant superintendent, Leonard Hershey, who has operated gravel plants for 25 years, said: "Deister Screens do a better job and cause less trouble than any screen I know."

Deister will do the same for you. Get the facts from your Deister dealer—or direct from the factory.

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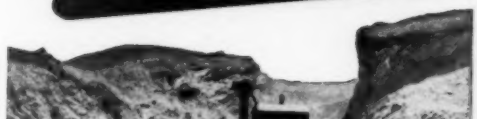
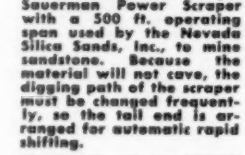


MORE YARDS with a

SAUERMAN *Long Range* MACHINE

Picture shows a 2 cu. yd. Sauerman Power Scraper with a 500 ft. operating span used by the Nevada Silica Sands, Inc., to mine sandstone. Because the material will not cave, the digging path of the scraper must be changed frequently, so the tail end is arranged for automatic rapid shifting.

Sauerman Scraper Excavator



Sauerman Scraper Stockpiler

Sauerman Slackline Cableway

"The best bet for big output and low upkeep on any dig-and-haul job," say users all over the world, "and Sauerman machines are simpler to operate, too."

Yes, Sauerman machines feature speedy, trouble-free action under the control of a single operator . . . move large yardages from any point within their cable radii. Sauerman machines will reach across a river, deep down into a pit, up to the top of a hill or across a wide stockpile — and handle a heaping load every time. Digging, hauling and dumping are accomplished in one continuous rapid cycle.

Other desirable features of Sauerman Slackline Cableways and Power Drag Scrapers: First cost is surprisingly low . . . maintenance is negligible . . . flexibility of the machines means they can be extended readily and adapted to suit changing requirements.

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Established 1881 CARLISLE, PA.

a bituminous mixing plant. This producer also has two other quarry operations, all portable plants.

One of the world's largest producers of aggregate (Morrison-Knudsen) has produced 1,100,000 tons of aggregate for nine different jobs, some of them hundreds of miles apart. The record accumulated by one portable plant is 213,400 tons of concrete aggregates, 132,000 tons of plant-mix aggregates, 746,000 tons of base material for pavement and 8400 tons of miscellaneous material.

M. O. Weaver, Inc., Des Moines, Iowa, produced 600,000 tons of aggregate and 250,000 tons of manufactured sand for Ft. Gibson dam near Muskogee, Okla., with portable plants. Five finished sizes in all ranged from manufactured sand, No. 4 to ¾ in., ¾ to 1½ in., 1½ to 3 in., and 3 to 6 in., all from limestone, at a rate of 250 t.p.h.

On the construction of the Maine turnpike, Gibbons & Reed had a Pioneer 48-V. It saw service in the state of Nevada before being moved to Maine. The plant's production was said to be comparable with the other portable previously mentioned.

Among the established producers that have portable plants as a part of their operations might be mentioned: Arkhola Sand and Gravel Co., Arkansas; John T. Dyer Quarry Co., Pennsylvania; Kentucky Stone Co., Kentucky; Dolese Bros. Co., Oklahoma; Pacific Coast Aggregates, California; Central Materials Co., New York; France Stone Co., Ohio; Reed Crushed Stone Co., Kentucky; Rogers & Brunnhoeffer, Kentucky; Dell Needham, Wisconsin; Acme Materials Co., Oklahoma; B. L. Anderson, Iowa; Worlock Stone Co., New York; Hodgman, Minnesota; and Carney Co., Minnesota.

Florida Lightweight

THE PINELLAS COUNTY Light Industry Council, St. Petersburg, Fla., is seeking investors to establish a lightweight clay-aggregate industry in its area to serve the concrete products industry.

Concrete units are practically the only masonry used in Florida and, while some plants produce lightweight panel-wall units, heavy sand and limerock block predominate, as lightweight aggregates have to be shipped in from distant areas.

The Industry Council pointed out that the University of Florida's Engineering and Industrial Experiment Station at Gainesville recently issued a comprehensive report on experiments indicating the practicality of manufacturing lightweight clay aggregates in the state. With many Florida clay deposits available, the study reported that a $200,000 continuous sintering plant investment could produce 185 cu. yd. of aggregate per 24 hr. at a cost of $3.60 per cu. yd., while a $350,000 plant could produce 600 cu. yd. at $2.90 per cu. yd.

Cement Manufacture

(Continued from page 121)

whether or not the kiln speed should be changed or the kiln should be shut down for adjustment, and is effective in maintaining uniform load conditions.

There are thermocouples at other critical points on some kilns which likely are being used as a guide to best operation of the kiln according to zones so that high level heat effective in chemical changes may be more advantageously used for the purpose and low level heat be used for preheating. Work is being done by combustion engineers in the development of internal refractory tile for use in critical temperature zones of poor transfer and more may be heard of this. Such tile are being used in mills outside the United States.

Dust Collection

Every postwar cement mill installation has been featured by dust collectors throughout and there has been great progress in the methods for recovery and the handling of stack dusts. The modern plant has numerous automatic dust collectors, many of the bag-type, spotted in critical locations and in each installation dust is returned in process. As stated earlier, some of the newer mill buildings are actually operated under a slight negative pressure to improve working conditions and to minimize the adverse effects of dust on machinery.

Efficiencies in excess of 95 percent are required of modern stack dust collector systems. Combination collectors consisting of a cyclone-type collector, where the bulk of the dust is recovered, in series with an electrostatic precipitator in which the finer fractions are recovered, are finding favor. Such a system permits selective recovery and selective return of dust into the kiln and is particularly desired where the raw materials are of high alkali characteristics. Thus, the finer particle fraction may be wasted and dust be returned into the kiln only from the mechanical dust collector unit. Some unusually effective systems for selective return of dust have been devised, such as the Penn-Dixie system at Kingsport, Tenn., described elsewhere in this issue.

In a novel arrangement at a dry process waste-heat plant where all stack dust may be reclaimed, dust from the dust chambers, boiler hoppers, flues and electrical precipitator is placed into a bin by a system of collecting screw conveyors. Five-in. cement pumps transport the dust into the feed ends of the raw mills. About 9 percent of the total raw material is circulated dust.

An eastern mill has just completed installation of the first commercial hydrostatic precipitator in the industry. Much of the dust is settled first in a large dust chamber, for later recovery into the kiln, and the gases are put through a two-unit hydraulic col-

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VIBRATING SCREENS

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Your cement scalping or other scalping involving removal of lumps or foreign matter from extremely fine materials is best accomplished with a scalping screen offering maximum control.

Selectro 8-way vibration adjustment and easily controlled tilt enables your operator to maintain maximum screening efficiency at all times and quickly compensate for variation in material consistency. All adjustments are made readily in field. No special tools required.

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lector. Dust is subjected to the combined action of centrifugal force and thorough intermixing of the gases and the water and the dust is separated out by a water curtain. It settles to a reservoir and is sluiced to waste. An efficiency of 95 percent is anticipated.

An entirely new principle of returning stack dusts into kilns, developed at the Permanente Cement Co. plant, is described in a separate article. Briefly, it consists of mixing the dust with a thin clay slurry for chemical mix correction and forming nodules which are fed into a specified separate kiln. The process was perfected in efforts to combat high circulating loads in dust collecting and handling equipment due to the easy re-entrainment of dust, and to improve burning conditions which reduced kiln capacity and brick life because of variations resulting from the conventional methods of handling dust.

Reasonably hard nodules are formed of about 18 percent moisture content and fed into the kiln just below the chain section. Permanente has five 12- x 450-ft. rotary kilns. Dust from all the kilns is nodulized and fed into one kiln; a second also is arranged so it may be fed dust nodules. Approximately 50 percent nodules and 50 percent fresh slurry comprises the feed into the one kiln but the design is for a loading as high as 90 percent nodules. Important fuel economies have resulted, over-all production has been increased, greater uniformity has resulted and dust losses have been reduced.

Another article in this issue describes a new dust recorder designed for a continuous check of precipitator performance and to provide a record, as a check against efficiency and as evidence in the possible event of dust complaints. The sample of dust is taken continuously from the discharge side of the collector, on the low pressure side of the fan.

Finish Grinding

The postwar finish grinding department, with a few exceptions, comprises two-stage grinding in closed circuit. Grinding capacity has been increased to compensate for higher clinker output and also markedly because many mills have built mortar cement departments. There is a tendency toward the use of more compartmented-type mills and nearly all the newer installations of finishing circuits have air-cooled mechanical air separators. Cooling air drawn through the air separators and exhausted through bag-type dust collectors is effective in cooling the finished cement to as low as 150 deg. F. or less. A further advantage is that the dust filter may be operated with feed to the air separator stopped, to cool the equipment down sufficiently for men to enter for maintenance after only 15 or 20 minutes. Mechanical air separators have always been a trouble spot for maintenance because of the high temperatures. An increasing number of

recording thermocouples are observed in use at mill discharge ends as a guide to mill operation, particularly on water-jacketed mills.

Gyratory and cone-type clinker crushers precede the grinding mills in the majority of newer mills, reducing the top size of mill feed to about ½ in., which permits the use of smaller grinding media.

An exception to the majority of grinding mill installations is the one at Missouri Portland Cement Co., where cement is ground in open circuit without air separators. The two-stage grinding circuit consists of a 9½- x 11-ft. preliminary ball mill in closed circuit with vibrating screens carrying 26-mesh cloth to regulate feed size into the open circuit finish tube mill. Clinker at this mill has only a mild tendency to coat grinding balls and cement is being ground to 1700 surface area at 6.8 kw.-hr. per bbl. for the over-all system.

Packing

Packhouses are as nearly dust-free as any other mill departments and the emphasis has also been in design to prevent contamination. Extensive use is made of dust arrestors, alleviators, automatic level controls and lighted control panels for guidance of the operator and of palletized handling of sacks and other supplies. Packhouses like the newer ones of Huron Portland Cement Co. at Green Bay, Wis., and Superior, Wis. (ROCK PRODUCTS, January, 1951, pages 94-101) and those of Lone Star Cement Corp., at Birmingham, Ala., and Dallas, Texas (ROCK PRODUCTS, September, 1948, pages 82-87) are typical of modern practice. A trend toward more bulk cement deliveries continues in many sections of the country and several mills currently are adding bin facilities for truck loading.

Material Handling

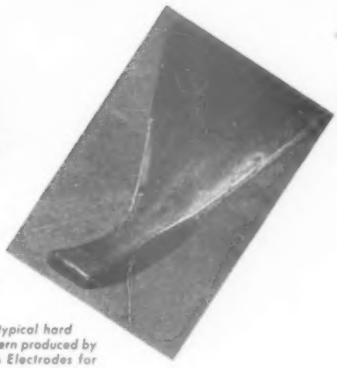
Air-activated gravity conveyors are coming into widespread use in the conveying of fine materials, in handling raw ground materials to storage, cement to storage, and separator rejects to grinding mills, dust, for handling kiln feed material, and for many other applications. The conventional enclosed duct-type is principally used, with or without auxiliary air-feeders, and the open-top type is finding increasing applications for transferring materials from bins.

Power

Unit substations are in great demand in cement mills, practice being to have a centralized main distributing power source and master switchboard from which power is distributed to strategically located substations throughout the mill. The first natural gas turbine for power generation in the cement industry has gone into service in the plant of C. A. Venezolana de Cementos, Pertigalete, Venezuela, which may prove an interesting development in this country.

Champion HARD SURFACING ELECTRODES...
for smooth handling...and excellent results

Illustrating the smooth deposit free from defects produced by Champion C-30 Electrodes.



Illustrating a typical hard surfacing pattern produced by Wear Devil A Electrodes for greatly increased service life.

C-30—The ideal electrode for building up wearing surfaces which must later be machined. Weld metal deposit will average 215 BHN (R_b 96) which gives much greater wear resistance than mild steel deposits. Weld is completely free of pinholes, slag traps, or heat checks and machines readily. Recommended for shaft build-up, steel mill pods, spindles, back-up chucks, and other similar applications.

HARD DEVIL—For economical build-up, this straight high carbon type of electrode gives smooth beads, low spatter loss, easy slag removal with a hardness of 255 to 400 BHN, dependent on base material. For building up Car Wheels, Tractor Shoes, Conveyor Equipment, Crusher Rolls, Gear Teeth, etc.

RAILENDER—For the repair of battered rail ends, Railender gives a dense, homogeneous deposit with an excellent bond to the rail. The weld shows a hardness of about 300 BHN, which gives long service life. Weld beads are smooth, even, and flow together well, requiring a minimum amount of finishing.

WEAR DEVIL C—Excellent for build-up on parts which require a balance between wear and wear resistance such as track links and rollers used in earth-moving equipment. Hardness of the deposit is 300 to 320 BHN as welded. Wear Devil C has excellent arc stability, low spatter, and deposits smooth welds in any position.

TOUGH DEVIL—Champion High Manganese Electrodes (11-13% Manganese) are available in two types: No. 1, bare or coated, contains 3½% Nickel, and No. 2, bare or coated, is stabilized with Molybdenum. Deposits average 10 to 20 R_c as welded and will work harden to 52 R_c. Tough Devil Electrodes are used for the repair of manganese castings, build-up of frogs and crossings, dipper teeth, etc.

WEAR DEVIL A—An excellent alloy, all-purpose hard surfacing electrode, useful in all positions on applications requiring a hardness of 495-555 BHN (50-56 R_c). Deposit shows excellent resistance to abrasion and moderate impact. Wear Devil A Electrodes have very good arc stability on both AC and DC, low spatter loss, easy slag removal and deposit smooth, even beads. Recommended for rock-crushing equipment, dipper teeth, bucket lips, grappling hooks, agricultural machinery, gears and pinion teeth and many others.

CHAMPION HARD SURFACING ELECTRODES have the excellent arc characteristics and smooth, easy handling of the Champion Mild Steel line built in.

WRITE FOR DESCRIPTIVE LITERATURE ON ANY OR ALL OF THESE ELECTRODES — ADDRESS DEPT. R

THE CHAMPION RIVET CO. CLEVELAND, OHIO and EAST CHICAGO, IND.

COMPLETE CRUSHING PLANTS
designed and equipped by FARREL-BACON

Farrel-Bacon provides a complete engineering service, including design of plant and supplying all equipment from primary crusher to bin gate. Jaw-type crushers are available in sizes from 60" x 48" to 10" x 7". *Write for complete information.*

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ANSONIA, CONNECTICUT

BA-5

At Your Service...
Our engineers are at your service
to help you determine the
proper ration of grinding balls
to avoid overgrinding.
Cal-Wic Screens, from filter cloth
to 6-inch space cloth
THE CALIFORNIA WIRE CLOTH CORPORATION, OAKLAND
THE COLORADO FUEL & IRON CORPORATION, DENVER
WICKWIRE SPENCER STEEL DIVISION, NEW YORK
STEEL FOR THE MINING INDUSTRY
THE COLORADO FUEL & IRON CORPORATION
CF&I

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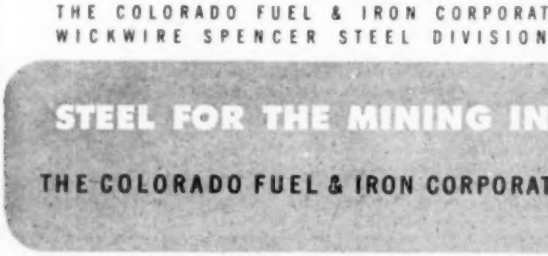

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ENGINEER & MANUFACTURER

50 BROAD STREET NEW YORK, N. Y.

ORDER ROCK PRODUCTS FOR EACH RESPONSIBLE MAN

Annual Report Winners

MARQUETTE CEMENT MANUFACTURING Co., Chicago, Ill., for the seventh consecutive year, won top honors for excellence in annual reporting, as was recently announced by the board of judges in the *Financial World* Annual Report Survey, who found Marquette's 1950 annual report to be the best in the cement industry. The bronze "Oscar of Industry" trophy was presented to the company at the awards banquet, held recently at the Hotel Statler, New York City.

A total of 5000 reports were considered in the international competition, the eleventh in the series of surveys. These reports were judged in 100 industrial classifications for the "Best of Industry" awards. General Portland Cement Co., Chicago, Ill., and Permanente Cement Co., Oakland, Calif., won second and third place honors for the cement industry.

Canadian Cement Plant

NORTH STAR CEMENT, LTD., Corner Brook, Newfoundland, Canada, has begun production of cement 13 months after construction of the plant was started. At present only clinker is being made and stored; when full production is reached the plant will make 600,000 bbl. of finished cement a year. The plant is owned wholly by the Newfoundland provincial government; North Star Cement, Ltd., is a subsidiary of the government. It is expected that the plant will be offered for sale to a private producer. The bulk of the output of the Newfoundland plant will probably be used within the province, where demand for cement has been increasing rapidly.

N.C.S.A. Accident Report

THE NATIONAL CRUSHED STONE Association reported in its *Monthly Accident Review* that the September, 1951, accident record showed the need for safety glasses and safety shoes in some plants. Four serious eye injuries and three foot injuries were reported. It was emphasized that the cost of safety glasses and safety shoes is more than offset by the savings accrued. In New York an eye is evaluated at $5000, an amount which would buy hundreds of safety shoes and glasses, even of the prescription type.

N.C.S.A. stated that some plants, in starting a safety shoe program, give the men the first pair of safety shoes free of charge, and contribute up to 25 percent of the cost of future purchases. All plants are being urged to participate in some such program.

For the month of September, 70 companies, representing 101 plants, sent in accident reports. Fourteen companies, representing 19 plants, were entered through the Agricultural Limestone Institute. Of the plants reporting, 83 had accident-free records. Three plants reported permanent injuries and 23 reported temporary lost-time injuries.

MANUFACTURERS NEWS

Borg-Warner Corp., Chicago, Ill., has announced the appointment of A. J. McAllister as president and general manager of the Detroit gear division. He was formerly president and general manager of the Fairfield Mfg. Co., Lafayette, Ind., and succeeds Howard E. Blood, who continues as a vice-president and director of Borg-Warner. D. T. Sicklesteel, formerly vice-president in charge of engineering for the Detroit gear division, has been appointed general manager of the Borg-Warner new products development laboratory.

Barber-Greene Co., Aurora, Ill., announces that E. H. Holt, formerly Eastern division sales manager, has been appointed general sales manager. W. B. Holder, who formerly held this position, has been named to head a new division, details of which will be announced later. J. D. Turner has been appointed director of publicity and promotion. Mr. Holt joined the company in 1939 as a field engineer. During World War II he was assigned to the Office of Chief of Engineers in the Research and Development Branch. He was subsequently assigned to the Engineers Board, Road and Airfields Branch, and later transferred to troop duty with the 1880th Engineer Aviation Battalion which did construction work in this country, North Africa, India and Burma. After discharge from the service, he became area manager for Barber-Greene with headquarters in the Washington office. He has been Eastern division sales manager for about a year.

E. H. Holt

J. D. Turner

J. D. Turner started in the Barber-Greene shop in 1925. Two years later, he transferred to the advertising department, becoming advertising manager in 1929. He was made director of publicity in 1945, and created the sales training course. He has been a member of the management board since 1948.

Cummins Engine Co., Inc., Columbus, Ind., announces that W. G. Turner has been appointed regional manager of the Great Lakes region, with headquarters at Cleveland, Ohio. He was formerly regional manager of the Southeastern region at Atlanta, Ga., and will be succeeded in this position

Specify **MERRICK**

for Feed Rate Control

FEEDOWEIGHT*

FEEDOWEIGHT* accurately, continuously and automatically feeds and weighs uniformly by Weight. Extensively used in Cement Plants for feeding and proportioning raw mix components as well as Clinker and Gypsum to finishing mill.

The FEEDOWEIGHT is gaining wide acceptance as an ideal medium for the blending of aggregates in Dam Projects, Also provides continuous totalization.

MERRICK also makes the WEIGHTOMETER* for weighing materials in transit on belt conveyors.

Write for our latest bulletin Nos. 551 and 375.

*Reg. U. S. Patent Office

MERRICK SCALE MFG. CO.

180 AUTUMN STREET • PASSAIC, NEW JERSEY

ROCK PRODUCTS FEATURES TIMELY INDUSTRY NEWS EACH ISSUE

CROSS PERFORATED STEEL SCREENS

Look for this Stamp on all Cross Products

the Sign of PLUS QUALITY FOR Plus Performance

- *More Open Area*
- *Tougher Steel*
- *Lighter Weight*
- *Reduced Costs*

Manufacturers

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CARBONDALE, PENNSYLVANIA

Service Agencies in all Principal Cities

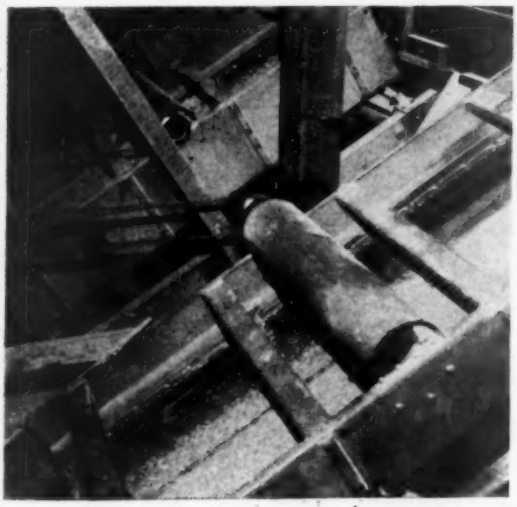
Telephone: 300

We invite you to visit our exhibit — Booth "C"

RESOLUTION FOR 1952:

"to get the most for my dollar in screening equipment"

Dollar for dollar, Universal Screens are your best buy!



Whether it's ag-stone as shown here, handled by a battery of Type "MR" 42"x96" two-deck Universals, or whether it's road-stone, pea-gravel, torpedo and mason sand or silica, the Universal provides cleaner separations at the greatest economy.

Write today for catalog No. 109 on Screens & Screening

UNIVERSAL VIBRATING SCREEN CO.

RACINE — WISCONSIN

Crusher Rolls REBUILT with MANGANAL

U. S. Patents 1,876,738 - 1,947,167 - 2,021,945

11% — 13½% Manganese-Nickel Steel

ROUND APPLICATOR BARS

Often Outlast New Ones!

FREE

Most effective methods of economical repairs to heavy equipment WRITE NOW!

NAME OF NEAREST DISTRIBUTOR ON REQUEST

Send for catalog and price list.

- MANGANAL replaces worn metal faster and more economically.
- MANGANAL workhardens up to 550 Brinell under the most severe impact and abrasion.
- MANGANAL is the toughest metal known not harmed by heat
- 12 SIZES are available for all conditions of wear.
- Attach with MANGANAL Bare or Special Tite-Kote Electrodes for greatest strength, longest wear

STULZ-SICKLES CO. SOLE PRODUCERS 93 N. J. Railroad Ave. Newark 5, New Jersey

by R. P. Parshall, who has been manager of the Milwaukee branch of Cummins Diesel Sales Corp. in Chicago. B. C. Sears has been appointed assistant regional manager at Atlanta, and Norman Grimes, regional service representative. R. F. Davis, formerly assistant regional manager of the Central region, Chicago, has been promoted to regional manager of the Eastern region in New York City. Walter N. Westland, formerly regional manager of the Eastern region, now heads Cummins Diesel of New England, Inc., with headquarters at Allston, Mass. Harold H. Lurie, chief metallurgist at Columbus, Ind., has been named a member of a six man Metallurgical Advisory Board to assist the U. S. Navy on a special technical project.

H. K. Porter Co., Inc., Pittsburgh, Penn., announces that J. J. Merkel and E. E. Klemm have been appointed branch managers of the Detroit and Cleveland districts, respectively, of the Quaker Rubber Corp., a division of H. K. Porter.

Koppers Co., Inc., Pittsburgh, Penn., has announced the appointment of Dr. Walther Mathesius as a consultant for the Freyn engineering department of the company. He was formerly president of the Geneva Steel Co., and will make his headquarters in Chicago, Ill. Henry A. Denny has been named production manager of the engineering and construction division. He was formerly assistant production manager and succeeds Frank Chambers, who has resigned.

Worthington Pump and Machinery Corp., Harrison, N. J., has announced that H. V. Rasmussen has been appointed executive engineer at the company's Wellesville, N. Y., plant. Mr. Rasmussen has spent a number of years with both the Westinghouse Electric Corp. and the DeLaval Steam Turbine Co.

Thermoid Co., Trenton, N. J., has reported that Willard H. Allen, New Jersey Secretary of Agriculture, has been elected to the company's board of directors.

The Howe Scale Co., Rutland, Vt., has announced several new appointments. Lierd E. Grant has been named manager of the Los Angeles branch. He will also continue as manager of the San Francisco branch where William J. Tucey has been appointed assistant branch manager. O. B. Collins, formerly associated with the company in Houston, Texas, has been made manager of the Atlanta branch, and Jack H. Brewer has been appointed manager of the company's Minneapolis branch.

The Howe firm also reports a change in location for its Chicago branch to 1915 N. Harlem Ave.

Allis-Chalmers Mfg. Co., Milwaukee, Wis., has announced the election, by the board of directors, of five new officers and the advancement of three others. W. G. Scholl, general sales

manager of the tractor division, was named vice-president in charge of sales for that division. In the general machinery division, C. W. Schweers, director of sales, was named vice-president in charge of sales; J. F. Roberts, director of engineering, was named vice-president in charge of engineering; and W. A. Yost, manager of the mechanical power department, was named a vice-president of the division. G. F. Langenohl, assistant treasurer, was elected to the position of treasurer and appointed assistant secretary. N. D. Johnson, assistant secretary, will continue to serve in that capacity and will assume additional responsibilities as assistant treasurer. Two new assistant comptrollers were also named: E. J. Dietrich, assistant to the comptroller; and T. D. Lyons, works comptroller.

Blaw-Knox Co., Pittsburgh, Penn., has announced the election of W. Cordes Snyder, Jr., as president and chief executive officer of the firm. Mr. Snyder previously was a vice-president of the company in charge of its Lewis foundry and machine division, and more recently has been vice-president of the Koppers Co. and manager of its metallurgical department. William P. Witherow, formerly president and chairman, will continue as chairman of the board. Chester H. Lehman will continue in his present capacities of vice-chairman of the board and executive vice-president.

Allied Chemical & Dye Corp., Solvoy Sales Division, New York, N. Y., has announced the promotion of John H. Elleman to the position of assistant director of sales and the appointment of Verne W. Aubel, Jr., successor to Mr. Elleman, as manager of the calcium chloride department.

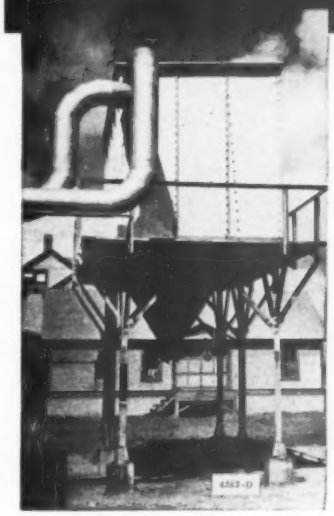
Pettibone Mulliken Corp., Chicago, Ill., has announced a major reshaping of company sales policies, with the creation of a director of sales and an assistant director of sales, with headquarters in Chicago. W. E. Madden, formerly vice-president of George Haiss Mfg. Co., has been named director of sales, and J. M. Hume, previously vice-president of Universal Engineering Corp., has been made assistant director of sales.

Chain Belt Co., Milwaukee, Wis., has announced the appointment of the Cate Equipment Co. as its new district sales office in the Salt Lake City area.

Cleaver-Brooks Co., Milwaukee, Wis., has announced the appointment of F. A. Hopp as advertising manager.

Sterling Electric Motors, Inc., Los Angeles, Calif., has announced the appointment of the following distributors: Allied Bearings Supply Co., Tulsa, Okla.; Berry Electric Co., Walla Walla, Wash.; Alabama Bearings Co., Inc., Montgomery, Ala.; Stanley Electric Motor Co., Stockton, Calif.; and Roy A. Berentz Co., Inc., Houston, Texas.

SLY PIONEERS and LEADERS IN DUST CONTROL



WE EMPLOY
NO SALESMEN
BUT
MATURE
ENGINEERS
are at your service
without obligation

BRANCHES IN:
NEW YORK • CHICAGO • PHILADELPHIA • SYRACUSE
DETROIT • BUFFALO • CINCINNATI • ST. LOUIS
INDIANAPOLIS • BIRMINGHAM • LOS ANGELES • TORONTO

A proper application of Dust Control Equipment to your needs is definitely a Science.

Your Sly Engineer, backed by an experienced Technical Staff at the home office, brings that Science to your door.

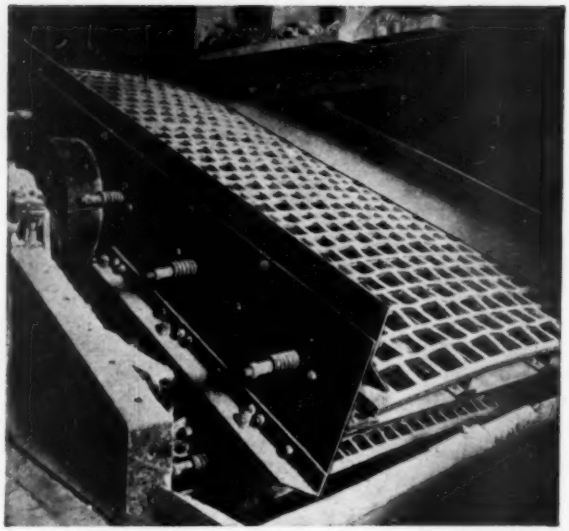
It costs NO MORE (sometimes LESS) and you are assured of many years of *completely* Dustless Service.

THE W. W. SLY MANUFACTURING CO.
4746 TRAIN AVENUE CLEVELAND 2, OHIO

LOOKING FOR HELP? SEE THE CLASSIFIED SECTION!

HAYWARD BUCKETS
WON'T QUIT OR CAUSE TIME OUT
A Hayward Bucket keeps the job going ahead on scheduled time. It won't quit or cause time out.
THE HAYWARD COMPANY
202-204 Fulton Street
New York, N. Y.

Outstanding Advantages of Hendrick Perforated Plate



for vibrating and shaking screens

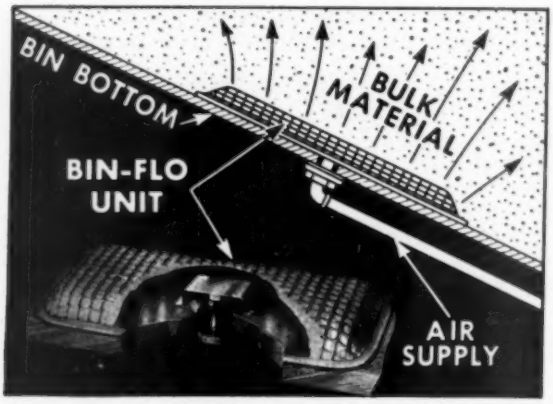
- It maintains uniformity of mesh throughout an unusually long service life.
- It can be supplied with any desired shape and size of perforations.
- It can be made—either flat or corrugated—in any required gauge in tank, high carbon, high tensile, and abrasive-resisting steels.
- For screening highly abrasive materials, it is heat-treated to increase its toughness.
- Its full clearance practically obviates clogging.
- The ease with which decks can be changed cuts labor costs.

Write for copy of Hendrick Perforated Plate Catalogue

SEE OUR CATALOG IN SWEET'S

HENDRICK
Manufacturing Company
47 DUNDAFF STREET, CARBONDALE, PENNA.
Sales Offices In Principal Cities

Perforated Metals
Perforated Metal Screens
Architectural Grilles
Mitco Open Steel Flooring,
"Shur-Site" Treads and
Armorgrids



BIN-FLO

USES SMALL VOLUME OF AIR AT LOW PRESSURE

KEEPS BULK MATERIALS MOVING

BIN-FLO units in bins, chutes, hoppers, etc., restore flow characteristics to dry, finely ground materials which tend to pack or bridge in storage. Types for all materials and conditions. No moving parts; simple installation; negligible operating cost; no maintenance cost.

BIN-DICATOR bin level indicator—"The Eyes of the Bin"—automatically reports levels of materials in storage; automatically controls filling machines; prevents waste.

NEW 20-PAGE BOOK FREE

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MANGANESE STEEL
WEARING PARTS

TIMANG WELDING PRODUCTS

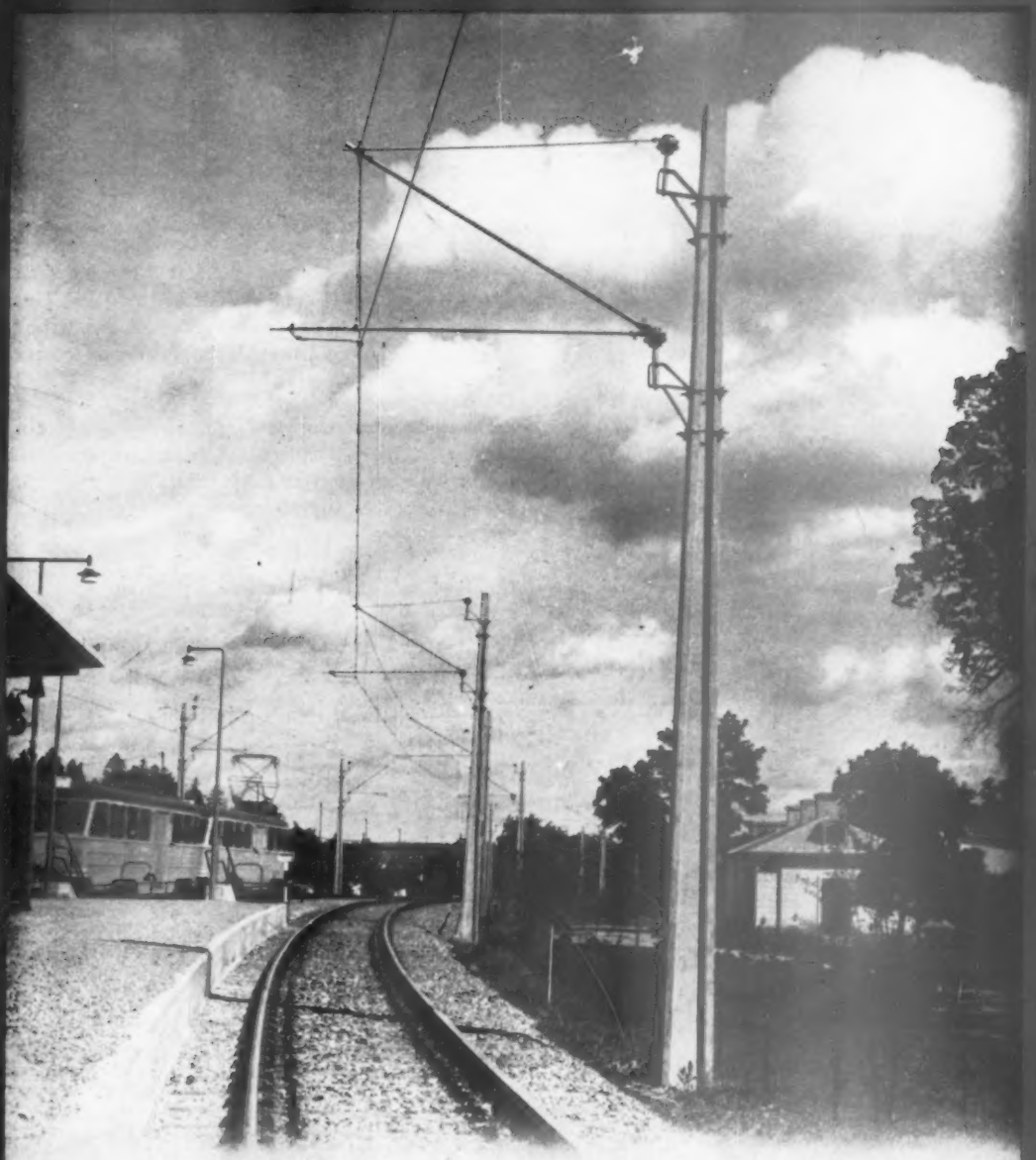
Since TW 1742

TAYLOR-WHARTON
IRON and STEEL COMPANY
High Bridge, New Jersey
Cincinnati, Ohio, Birmingham, Ala., Easton, Pa.

CONCRETE PRODUCTS

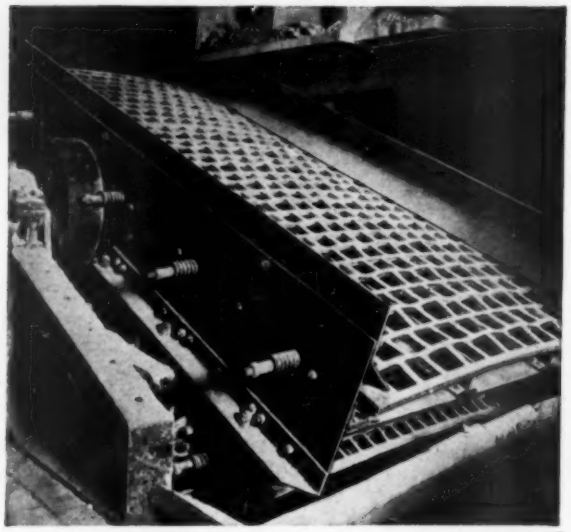
A SECTION OF ROCK PRODUCTS

CONCRETE UNITS · READY-MIXED CONCRETE



Swedish railway uses prestressed concrete poles

Outstanding Advantages of Hendrick Perforated Plate



for vibrating and shaking screens

- It maintains uniformity of mesh throughout an unusually long service life.
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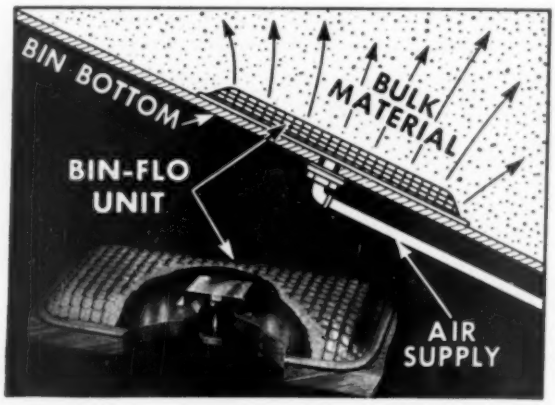

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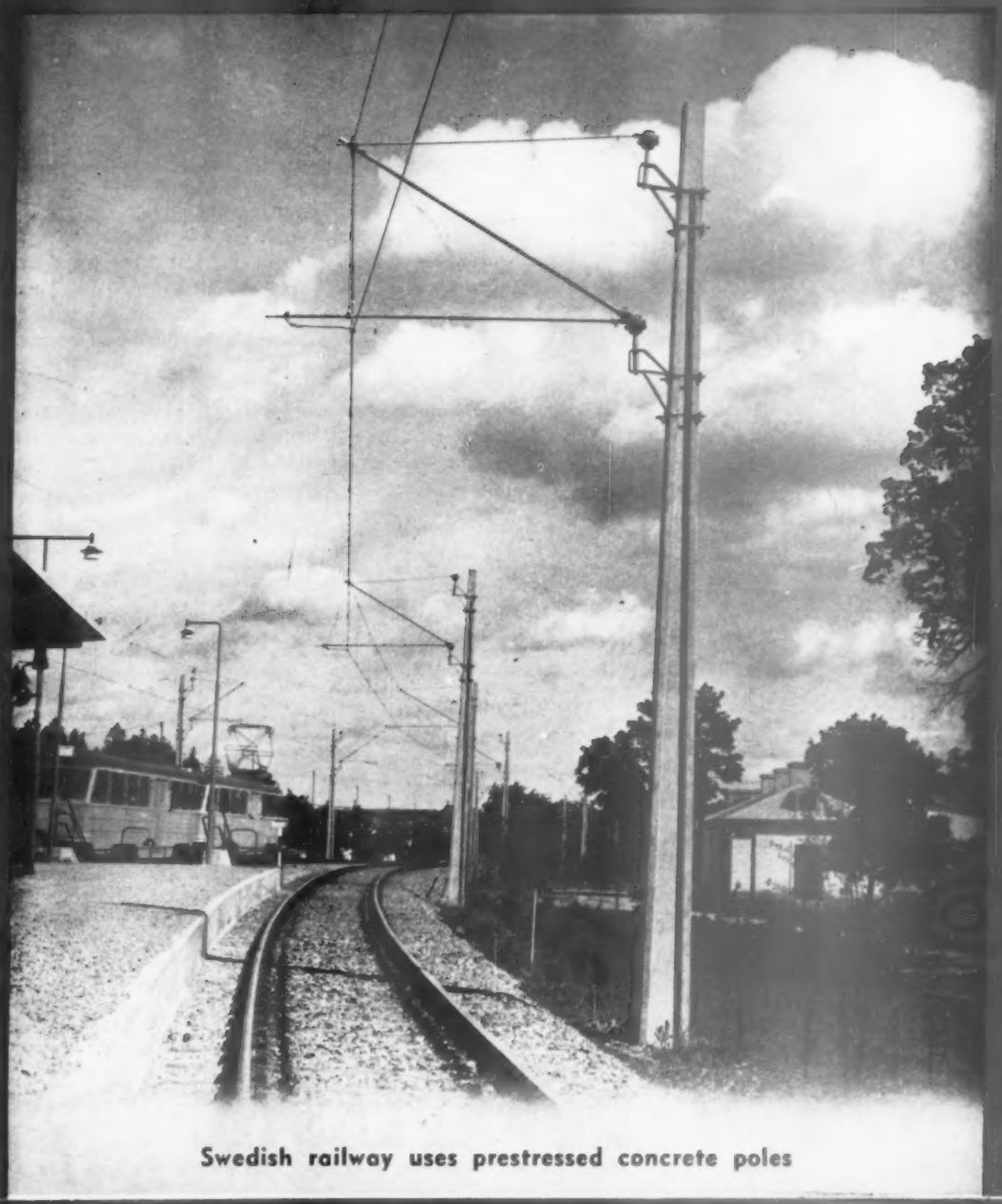


Swedish railway uses prestressed concrete poles

"I would like you to know

what DURAPLASTIC has done to improve my products and save money"

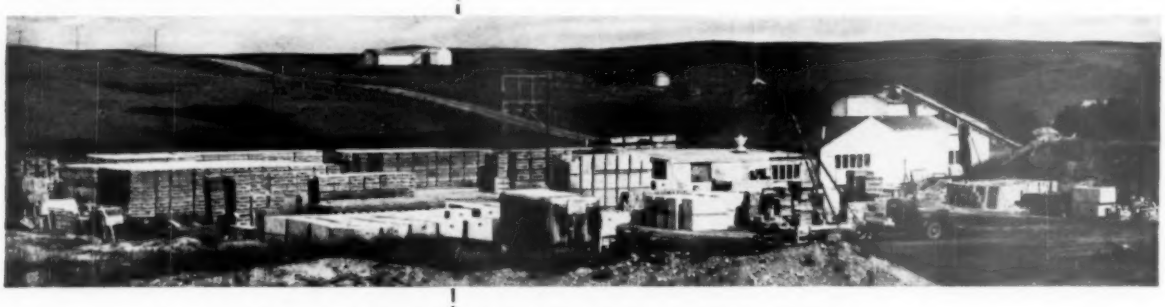
says Kenneth A. Schultz of Schultz Concrete Products Co., Minot, N. D.

"For years I used different brands of cement, mostly 'regular' and was troubled by poor feeding of the mix in the block machine, fresh blocks that would not stand the least jar when they were green, and a large percentage of culls off the racks when we cubed for yard stockpiling," notes Mr. Schultz.

"The last two years I have used 100% Duraplastic and find the mix feeds through the machine without trouble. Duraplastic makes a mix that sticks together, almost eliminating breakage. And our culls in unloading and cubing are so few now that it would be hard to figure a percentage," he adds.

Mr. Schultz's experience with Duraplastic air-entraining portland cement is typical. That's why so many manufacturers prefer Duraplastic for concrete block brick, pipe, drain tile and silo staves, and other products.

AT HIS PLANT (below) Mr. Schultz also makes precast septic tanks, well curbing, patio blocks, splash blocks and other products using a wet mix. He finds Duraplastic "makes concrete more watertight and prevents bleeding."



YET DURAPLASTIC* COSTS NO MORE

It sells at the same price as regular cement and requires no unusual changes in procedure. Complies with ASTM and Federal Specifications. For descriptive booklet, write Universal Atlas Cement Company (United States Steel Corporation Subsidiary), 100 Park Avenue, New York 17, N. Y.

OFFICES: *Albany, Birmingham, Chicago, Dayton, Kansas City, Minneapolis, New York, Philadelphia, Pittsburgh, St. Louis, Waco.*

"Duraplastic" is the registered trade mark of the air-entraining portland cement manufactured by Universal Atlas Cement Company

CP-D-134

ATLAS® **DURAPLASTIC**

AIR-ENTRAINING PORTLAND CEMENT

Makes Superior Concrete Products at No Extra Cost

"THE THEATRE GUILD ON THE AIR"—*Sponsored by U. S. Steel Subsidiaries—Sunday Evenings—NBC Network*

INDUSTRY NEWS

Shown above are members of A.S.T.M. subcommittee C-13 (concrete pipe) who met in Chicago, Ill., recently, to prepare a draft of a low-head pressure pipe specification. Left to right: Howard G. Curtis, U. S. Department of the Interior, Bureau of Reclamation, Denver, Colo., chairman; M. W. Loving, consulting engineer, Glenview, Ill.; J. B. Verhoek, (proxy for Samuel A. Greeley, consulting engineer), Chicago, Ill.; Joseph A. Dunn, Hume Pipe of New England, Inc., Swampscott, Mass.; E. F. Kelley, Division of Physical Research, Bureau of Public Roads, Washington, D. C.; and Henry A. Weigand, United Concrete Pipe Corp., Baldwin Park, Calif.

Concrete Masonry Meeting

THE CONCRETE MASONRY Manufacturers Association held a general membership meeting, November 27, 1951, at the Rodger Young Auditorium, Los Angeles, Calif. Guest speaker at the meeting was George O. Prussell who is affiliated with the Los Angeles Chamber of Commerce in the Economics Control Section and is also manager of the Television Section of the association. His subject was "Merchandising a Must."

Vermiculite-Sand Concrete

ZONOLITE Co., Chicago, Ill., has announced the development of a new vermiculite-sand concrete mix which is said to meet the needs of engineers and architects for a semi-lightweight, strong, floor concrete.

Vermiculite has long been used as a plaster and concrete aggregate because of its lightweight and insulating qualities. A mica-like, granular mineral, it contains tiny air cells which retard the passage of heat.

The new concrete mix, intended for structural floors, as a fill over structural floors, or for floors on the ground, weighs approximately 80 lb. per cu. ft. Its lightweight feature will cut down the dead weight of multistoried buildings which, in turn, is expected to reduce structural steel requirements.

Materials for the new mix will be purchased separately by contractors and mixed on the job, according to the Zonolite firm. The mix recommended consists of 1 cu. ft. of cement, 3 cu. ft. of stabilized vermiculite concrete aggregate and 2 cu. ft. of sand—known as the 1:3:2 mix.

While no additional concrete topping is required over vermiculite-sand concrete, a floor covering, such as asphalt tile, is recommended.

Tests conducted for Zonolite Co., indicated that vermiculite-sand concrete has an insulating value approximately four times that of ordinary sand concrete, with only half its weight. The mix also has passed load tests with a wide margin of safety.

Concrete Products Meeting

THE MO-KAN CONCRETE Products Association held its first annual meeting December 13, 1951, with an attendance of approximately 50 people. Following a dinner, the retiring president, George W. Goelitzer, Cinder Concrete Products, Inc., introduced the newly elected officers. They are George W. Kulhavy, Carter-Waters Corp., president; L. L. Daugherty, Eternacrete Products, Inc., vice-president; Gus Main, Kansas City Concrete Pipe Co., secretary; and C. Ernest Swanson, Concrete Building Units Co., treasurer.

In accepting his new duties, Mr. Kulhavy called attention to the plans which have been under consideration for some time of a concerted program under association auspices to draw public attention to the merits of concrete masonry as well as to place emphasis upon the need for close observance of approved construction methods in their use both below and above ground. Committees will work out advertising and direct mail programs which are expected to benefit not only association members, but the entire concrete masonry industry throughout the Kansas-Missouri area.

Cover Picture

SWEDEN HAS BEEN using prestressed concrete for various types of concrete products for a number of years, as is noted by M. W. Loving on page 232 of this issue. These prestressed concrete poles for a railway in Stockholm, have a top cross section of 6.3 x 6.3 in., bottom cross section of 19.7 x 6.3 in., and the web is only 2.4 in. thick; the pole is 34.5 ft. high.

BLUE DIAMOND CORP., Los Angeles, Calif., large building materials firm, has been named the exclusive distributor of Crownite, a lightweight aggregate, in the Los Angeles area, as was recently announced by the Crownite company. Blue Diamond will handle all gradations of Crownite, from 1-in. coarse aggregate for monolithic concrete, down to plaster sand. Blue Diamond also supplies ready-mixed concrete made with Crownite.

GLENN C. BARNES, Syracuse, N. Y., has sold his interest in Auburn Cement Products Co., Inc., Auburn, N. Y., to John D. Daly of Auburn. Mr. Barne's father, George Barnes, built the plant and started in the concrete block industry in 1916. Mr. Daly has been manager and vice-president since 1942. During World War II, the plant operated almost exclusively for the Navy, supplying building block and ballast block.

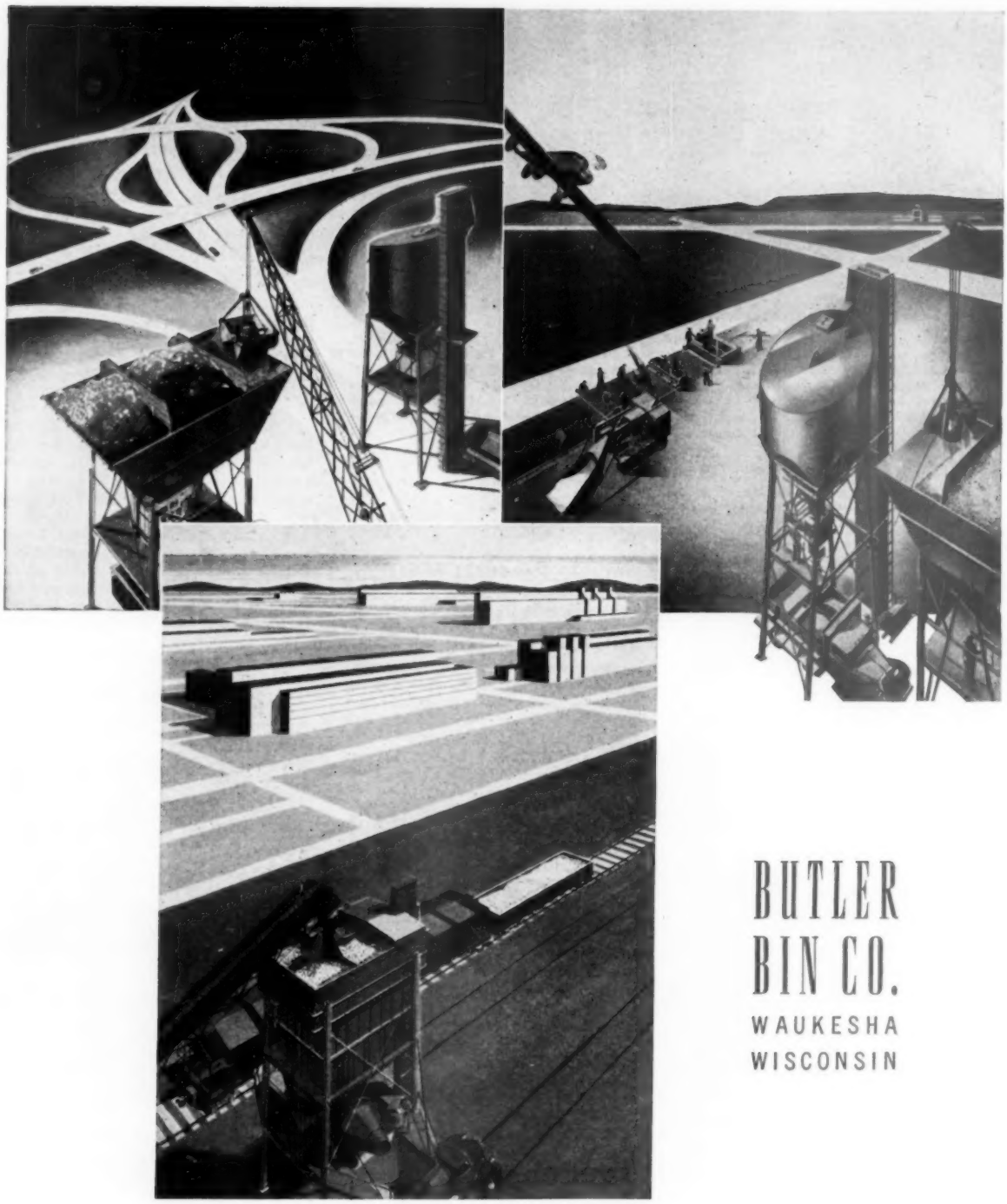
UNIVERSAL CONCRETE PIPE CO., Columbus, Ohio, recently opened a branch plant in Florence, Ala., where pipe in sizes of 4, 6 and 8 in. will be manufactured. Larger sizes of pipe will be shipped from the Decatur, Ala., plant and stocked at the Florence yard. The Florence installation will be under the supervision of A. E. Morris, Decatur, Ala. This brings Universal's network to 24 plants, located in ten states.

HARDWICK CONCRETE CO., INC., recently began operations of its new ready-mixed concrete plant at Hickman Mills, Mo., a suburban location near Kansas City. Plant equipment includes three 4-cu. yd. transit mixer trucks. About 10,000 cu. yd. of shale were removed from a hillside location to permit the delivery of rock and sand on the top level and a gravity flow through the hoppers and batching plant to the trucks at street level. Lee Hardwick is president of the company.

F. E. SCHUNDLER & CO., INC., producer of Coralux (perlite aggregate), has issued a new catalog containing information and specifications covering plaster, acoustical and concrete application. The catalog is intended as a guide for architects, heating engineers, contractors, builders and dealers, and may be obtained from the company at 504 Railroad St., Joliet, Ill., or from 45-15 Vernon Blvd., Long Island City, N. Y.

BURNUP AND SIMS CO., West Palm Beach, Fla., recently began operations at its new concrete block plant in Melbourne, Texas. Plant capacity is 900 block per hr.

CAPE READI-MIX CONCRETE CO.'S plant at Cape Girardeau, Mo., was recently sold to Clarence Shirrell of Cape Girardeau. The plant, which had been unused for eight years, has now been reopened and a mixer truck has been added to the plant facilities.



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POSTWAR DEVELOPMENTS IN THE CONCRETE MASONRY INDUSTRY

A summary of manufacturing and product developments that continue to entrench concrete masonry as a favored building material

By HUBERT C. PERSONS*

WHAT IS THE PRESENT position of the concrete masonry industry in the field of construction materials? Has it reached its peak or will it continue to grow? What are the factors most responsible for the growth of the industry? What are the newest developments in manufacture, use and testing of concrete masonry units? Answers to these questions have been sought from a number of men whose entire business lives have been devoted to the industry and who have made outstanding contributions to the development of manufacturing methods, applications, merchandising and technological research. Technical reports, theses, historical data and statistics have been studied. We have visited concrete block plants and talked with owners and workmen. This article is a report of the conclusions drawn from these interviews and studies.

Today, according to competent authorities, concrete masonry units represent at least 60 percent of the volume of all new masonry wall construction in homes, industrial and commercial buildings, schools, hospitals and other structures.

For the last five years annual production of concrete masonry in the United States has been well over one billion units, the equivalent of more than 12 billion standard size clay brick. That rate of production absorbs nearly 15,000,000 bbl. of portland cement which is approximately 7 percent of the recent annual production. In dollar volume the concrete masonry industry has passed the $300,000,000 mark.

Production statistics on concrete block vary considerably according to source, as do figures on the number of plants in operation from year to year. After World War I and again for several years following the second World War, hundreds of small plants, many of the so-called "backyard" variety, were in operation. Then too, government statistics usually do not segregate concrete masonry plants from the establishments making other concrete products. For example, based on 1947 figures plus later sample surveys, U. S. Bureau of Census estimates the present number of concrete products plants at 4500. How many of these are actually block plants is not known with certainty. R. E. Copeland, director of engineering of the National Concrete Masonry Association, estimates there were not more than 2000 to 2500 concrete masonry plants of any consequence in operation in the United States in 1951.

A tabulation by ROCK PRODUCTS, published some years ago, showed there were 3700 concrete block plants in the United States in 1941. Of these, 148 plants were turning out more than 40 percent of the total production and 93 percent was coming from only 36 percent of the plants. Presumably hundreds of small plants which were started in the hope of obtaining government contracts at the beginning of World War II have since gone out of business.

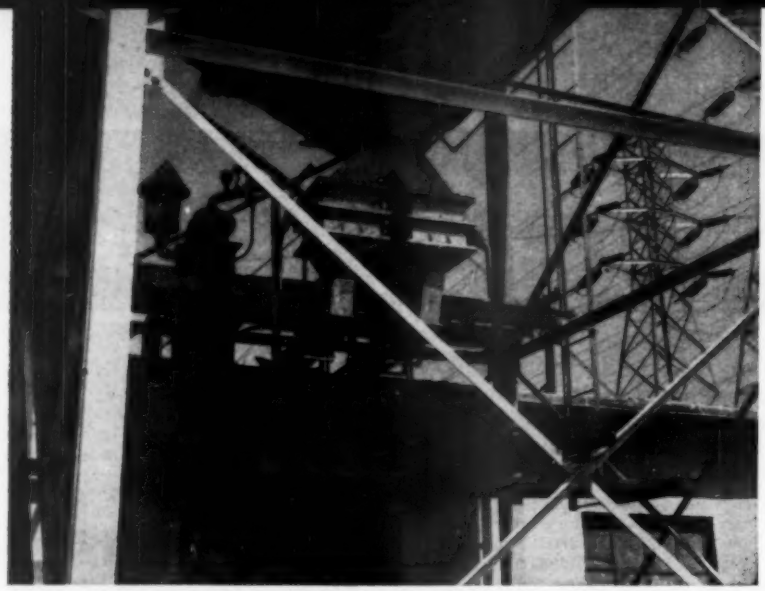
The National Concrete Masonry Association has 729 regular, associate and contributing members, some of whom operate two or more plants. These members account for a high percentage of the annual production of concrete block, although figures are not available. Studies made in 1948, however, showed that a relatively small number of plants were producing more than half the total annual production of concrete masonry units.

Table I offers a comparison of the rate of production of concrete block, clay brick and structural clay tile. It gives the estimated annual production of concrete block and clay brick from 1925 through 1949 and of structural clay tile from 1937 through 1949.

Bigger Volume with Fewer Plants

Most authorities believe that production of concrete masonry units will continue to increase for the next several years, but that there will be a gradual decline in the number of plants. It is pointed out that the establishment of a medium size concrete block plant now requires an investment of from $150,000 to $200,000. A new plant built near Chicago recently cost close to $500,000. One block producer in the East, during the past summer, invested more than $50,-

*Industrial public relations consultant, Chicago, Ill., for many years manager, Public Relations Bureau of the Portland Cement Association.



Transfer of bulk cement in block plants can be done efficiently with air-activated gravity conveyors of the type developed by and used in portland cement manufacturing plants. Here two low pressure air conveyors feed cement from the storage bin to two batchers

000 in cement handling equipment alone.

The concrete masonry industry in 1951 appears to be more stable than ever before. Present day block producers feel a keen sense of responsibility to maintain ever higher standards of quality. Many who were led to believe that the concrete block business was a soft way to make a "fast buck" have dropped out. It is believed unlikely that the reputation of concrete masonry will ever again be jeopardized as it was during the last war by the few who sold green block rather than turn down an order.

In price also, concrete masonry has remained stable, showing a percentage of price increase that compares favorably with any construction material. Naturally this price stability is a reflection of the fact that the cost of portland cement and aggregates, the basic ingredients of concrete block, have increased less, over the years, than other materials used in the building industry. The price record for cement can be seen in the graph in the review and outlook article on page 237 of this issue, giving the construction cost index and the price index of all building materials from 1939 through 1951 as reported by the U. S. Department of Commerce.

Factors Responsible for Growth

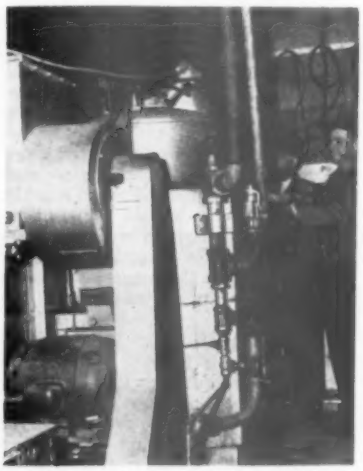
There are varying viewpoints on the factors most responsible for the rapid expansion of the concrete masonry industry. Some "off-the-cuff" opinions give considerable weight to the fact that war shortages of steel, lumber and other traditional construction materials gave concrete block an opportunity to get a stronger foothold in the construction field. But few believe that war shortages were a primary factor in the growth of the concrete masonry industry.

W. D. M. Allan, director of promotion, Portland Cement Association, believes it is highly important to remember that although the block industry has been accelerated at various times, it has been a steady rather than a mushroom growth — an expansion which was the logical and inevitable result of technological improvements achieved by the industry. When the opportunity came for use of concrete masonry in larger fields, the material had already proved its worth.

In an address before the board of directors of N.C.M.A., June 17, 1951, Mr. Allan pointed out that, "In the decade before 1935, the concrete masonry industry was one of the leaders in technological development." He described conditions in the industry in 1920 when there were about 10,000 block plants in the United States, 95 percent of which used hand-operated equipment and turned out a poor quality of block. In that year, the first annual meeting of the Concrete Products Association was held in Chicago. The name was changed to Concrete Masonry Association in 1930 and to the National Concrete Masonry Association in 1934.

Mr. Allan described fire tests made at the Underwriters' Laboratories in cooperation with the Concrete Products Association, the American Concrete Institute and the Portland Cement Association which resulted in getting favorable fire insurance rates for concrete masonry. On the basis of strength and durability tests in commercial and college laboratories, the American Concrete Institute then developed a recommended practice for

Two 6- x 7- x 70-ft. rotary kilns are utilized in the Lake City Lightweight Aggregate Corp. plant, Lake City, Tenn., to produce an expanded shale lightweight aggregate. Plants like this are essential to the continued growth of the concrete masonry industry



Bestone Concrete Corp., Chardon, Ohio, has used recent equipment developments to speed up the curing cycle. This plant is one of the first in the country to cure its block with steam supplied by a steam generator which develops 200 p.s.i. steam pressure in 2 min. from cold water and brings the kiln temperature up to 180 deg. F. quickly. The machine, which cycles on and off automatically, was originally designed to supply steam in diesel-electric locomotives

concrete masonry construction from which building code revisions could be made. As a result of this work there are now few local codes that do not recognize concrete masonry on an equitable and competitive basis with other masonry materials.

After insurance rates were adjusted and building codes changed, Mr. Allan told how concrete masonry manufacturers, with the cooperation of P.C.A., financed an extensive series of wall tests at the University of Illinois. These tests proved conclusively that concrete masonry walls, properly laid up of units which conformed to standard specifications, had ample stability both for axial and eccentric loading to meet all provisions of building codes.

Another important development was a series of rain penetration tests conducted at the P.C.A. development laboratories. These tests proved that concrete masonry walls, properly built and protected by portland cement paint, were highly weather resistant.

Mr. Allan then sketched the work done by the industry between 1925 and 1935 in plant layout, curing, grading of aggregates and testing to insure compliance with specification requirements. He declared, "It is fair to say that by 1931 or 1932 concrete masonry technology was as far advanced and complete as the technology of any other building material. By the time the depression hit, the concrete masonry industry had a good technological foundation on which to build an aggressive merchandising campaign."

There are probably few who will disagree with Mr. Allan's emphasis on the major importance of the basic technological work done by the industry and on the vital necessity of continuing such work. But there are other factors named as having a great influence on the growth of the industry.

Lightweight aggregate from clay. Sinter cake here being discharged from a sintering machine is about 10 in. thick. It produces a stable aggregate and makes a concrete weighing 100 to 102 lb. per cu. ft.

Lightweight expanded clay aggregate block coming off an automatic block machine at Rocklite Products, Ventura, Calif. The use of calcined shale lightweight aggregate is not limited to precast units, but is also being used increasingly in monolithic concrete

Influence of High Speed Machines

Paul M. Woodworth, director of research and development, Waylite Co., Chicago, Ill., believes one of the most important contributions has been the development of fast, precise machines for the mass production of high quality block. This modern equipment not only speeds up production but holds down costs and makes a block with many plus values.

Next in importance, Mr. Woodworth believes, are the large capital expenditures made by individual local block plants in modernizing their methods of manufacturing and handling block. He believes the superior service rendered to builders, architects and owners by locally owned concrete masonry plants has had a profound influence in establishing prestige and respect for the block industry and for the product.

The fact that concrete block were first in the masonry field to offer modular sizes to the construction industry has also had a favorable influence on increased acceptance for concrete block. Availability of modular sizes has been a great incentive to architectural designers to use concrete block.

The increased availability of lightweight aggregates and the development of floor systems using concrete masonry filler block are cited by an authority of the Portland Cement Association, as having an important bearing on the growth of the block industry. The successful use of concrete masonry units in prestressed concrete construction has also opened the door to new markets.

There are important developments in lightweight aggregates as a result of intensive research. There are new trends in curing, plant design and layout and material handling. There are

The first plant in the industry to use the Dwight-Lloyd sintering process, Carolina Tuff-Lite Corp., Salisbury, N. C., makes a lightweight aggregate from clay. The view below shows the ignition furnace of the sintering machine; the bed in the foreground is a hot, burning mass of sintered clay

also new developments in surface treatments and laying of concrete masonry; in floor systems and in scientific research and testing affecting concrete masonry. Much attention is being given to means of preventing cracking in concrete block walls. Substantial progress is reported toward eliminating pop-outs and minimizing staining of cinder block walls.

The order in which they are discussed here does not necessarily reflect the relative importance of these various trends and developments.

Trend Toward Mechanization

The strongest present day trend is toward complete mechanization of every step in block manufacture. Perhaps the latest trend is toward cubing of block in the machine room, a practical step where sufficient space is available. When this is done racks are moved from the kilns directly to a cubing area. The basic purpose is to minimize rack and lift truck movement.

The development of a power off-bearing hoist, fork-type high-lift trucks and block cubing yard hoists gave plant layout a new importance. In recent years manufacturers of block machines and other equipment have been frequently called on to advise concrete masonry manufacturers in modernizing their plants for greater efficiency.

With more attention being given to efficient handling of block in the plant and yards, loading and delivery of block has been similarly improved. A number of specially designed trucks incorporating various mechanical devices to facilitate unloading on the job site have appeared. One of these is the "roll-off" truck body designed by Arthur Rehberger and Son, Inc., Newark, N. J. Jack Freedman, president of Massachusetts Cement Block Co., Malden, Mass. has several "roll-off" trucks mounted on International truck chasses. In a demonstration for a group of visiting cinder block manufacturers at his plant last summer, a load of 8-in. block was deposited on the ground in 6 min. A number of other leading manufacturers have delivery equipment of similar type and, in some instances, contractor haulers have such facilities.

Another recent development is a "block unloader" developed jointly by Atlas Lime Co. and Allison Steel Manufacturing Co. of Phoenix, Ariz. According to a bulletin issued by the National Concrete Masonry Association, this equipment is designed to handle cubes of seventy-five 8- x 8- x 16-in. block. A load of ten cubes, 750 block, can be unloaded in 15 to 20 min. The cubes are lifted by a bridle suspended from a trolley on an overhead I-beam.

The past summer has seen increased attention given to more efficient handling of cement and aggregates. It is recognized that in plants producing 25,000 block per day or more, savings of a small fraction of a cent on certain operations can run into considerable amounts.

One of the most modern installations for handling bulk cement in any block plant was put into operation last summer in the plant of V. Paturzo Bros. and Son, Inc., Baltimore, Md. This is a combination of a Fuller-Kinyon pump to storage bins, and air-activated gravity conveyors, F-H Airslides, under all bins to convey controlled amounts of cement to mixer scales. At a meeting of the National Cinder Concrete Products Association in Boston last August, Sam Paturzo reported that this set-up could handle 250 bbl. of cement per hour at a cost of approximately 6 cents per bbl.

Curing Trends

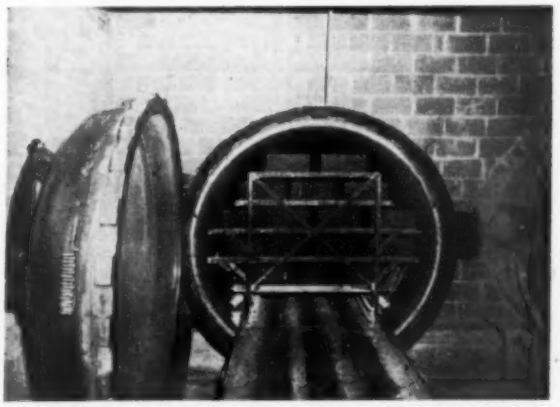
R. E. Copeland, director of engineering, N.C.M.A., commented that block manufacturers are giving more attention to curing than ever before. Some modern plants have kilns equipped with automatic temperature and steam control devices and keep careful charts of curing and drying cycles. One notable example of a plant with this type of equipment is the new Blue Island plant of Illinois Brick Co., Chicago, Ill. This plant has 20 curing kilns arranged in two banks of ten each.

In the last few years a majority of the more progressive plants have adopted high temperature steam curing at atmospheric pressure. High temperature curing is in the range of 160 to 210 deg. F.; intermediate is from 120 to 160 deg. F., and low temperature, 70 to 120 deg. F. The advantages of high temperature curing are said to include less tendency of block to crack under rough handling, lighter color, lower moisture content and higher compressive strengths at an early age. High temperature curing and drying enables block to meet standard specification requirements within 24 to 48 hr. after removal from the kiln. Many plants using high temperature curing have blowers or exhaust fans to clear steam from the kilns before removing racks. A few are equipped to dry block by blowing in warm dry air.

Very recently a few block plants have begun applying what is called the three-step curing-drying process. This involves steam or moist curing followed by normal air curing and drying in the yards for from 7 to 14 days and finally accelerated drying at an elevated temperature either in the stockpile or in dry-heated kilns.

Accelerated drying in the stockpile involves the use of some type of portable heater and canvas covers. Accelerated drying has increased in importance with the extensive use of concrete masonry on government construction where block must meet the 30 percent moisture content requirement of the Corps of Engineers, U. S. Army.

The three-step curing-drying process is briefly described in Bulletin No. 35 issued Sept. 24, 1951, by the National Concrete Masonry Association, and the use of portable unit heaters for stockpile drying is covered in Bul-



Labor costs were reduced in this high pressure steam curing plant by the installation on the autoclaves of quick-opening type doors which can be operated by one man. The door is swung into position against the autoclave and turned a fraction of a turn; lugs on the door engage corresponding lugs on the face of the autoclave

The high pressure steam autoclaves here were designed for speedy handling of block. The lift truck easily drives into the autoclave with its load of green block and removes cured units the same way. High temperature, low pressure steam curing is being perfected in efforts to approach the excellent properties of high pressure steam cured units

letin No. 34 issued by the same association on July 25, 1951.

According to Bulletin No. 34 the average cost of accelerated drying will be about 1.2 cents per 8- x 8- x 16-in. unit and 1.0 cent per 4- x 8- x 16-in. unit. Several types of portable heaters with capacities of 250,000, 350,000 and 550,000 B.t.u. per hr. capacity are said to be available. One is the Nelson heater made by Herman Nelson Corp., Moline, Ill. This has two 12-ft. long canvas air ducts which can be attached for better distribution of heat.

Best practice for plants which use accelerated drying is to schedule drying operations so that delivery of dried block may be made as soon as possible after they are ready, or to keep dried block under covered storage.

Basalt Rock Co., Napa, Calif., dries block with air at 180 deg. F. in kilns. To prevent reabsorption of moisture in the stockpile or on the job site, the block are then submerged in a dipping tank containing a waterproofing solution. (This is described in detail in ROCK PRODUCTS, January, 1950, page 200.)

Now that the trend is toward high temperature curing, proper insulation of curing kilns becomes important from the standpoint of both efficiency and fuel economy. Heating engineers say that proper insulation does not necessarily mean heavy, massive construction in a kiln. In fact it is said that many curing kilns in service today are of such heavy construction that they slow down the heating of the block. It is pointed out that heat goes into the roof, walls and floors of a kiln as well as into the block, pallets and racks.

According to the best authorities a satisfactory high temperature kiln need have no more than 2-in. of insulation in the roof and less in the walls. However, there should be a vapor seal properly positioned to keep the insulation dry. A cavity type wall has good insulation value and is said to cost less than a single unit type wall with insulation added.

As to size of kilns, one consulting engineer recommends as a minimum, 4 sq. ft. of kiln space per block produced per hour. On this basis a plant turning out 500 block per hour should have 2000 sq. ft. of kiln space. No more than 1000 block should be steamed at one time.

Tight doors on kilns are also essential to prevent undue heat losses. Custom-built doors with opening and closing devices are recommended (see ROCK PRODUCTS, February, 1951, page 155).

Adequate steam generating capacity, a necessity for efficient steam curing at any temperature, is reported as lacking in many plants. Without sufficient steam capacity optimum temperature cannot be achieved. Many plants are reported to have no means of determining kiln temperature.

One of the newest systems of low pressure steam curing utilizes a direct-firing heating unit which generates steam rapidly and releases it without turbulence into the kiln in great volume at regulated time intervals. This system is in use at the Syracuse, N. Y. plant of Barnes & Cone, Inc., and is being installed in several leading plants. After a year of operation with this system the owners report improved quality of block and greatly reduced curing costs (see ROCK PRODUCTS, January, 1951, page 191).

Bulk cement handling was simplified in the V. Peturzo Bros. and Son, Baltimore, Md., plant by the use of cement pumps, probably the first such installation in a concrete block plant. Note the pipe line going to the bin at left

Only about 20 block plants are reported to be using high pressure steam curing at present. Proponents of this system of curing say that it produces high strength block with minimum expansion characteristics in a shorter time than by any other method. With a possibility of block specifications becoming more rigid, advocates of high pressure steam curing believe this system will be more generally used in a few years.

Cost of autoclave installations and the necessary boiler equipment have been a barrier to more extensive use of high pressure steam curing. Multiple autoclave installations suitable for large volume production of block, cost $250,000 and more. The five 95-ft. long autoclaves and 300-hp. boiler installed a year ago in the plant of Harter Marblecrete Stone Co., Inc., Oklahoma City, Okla., are reported to have cost close to $300,000. There are other notable high pressure steam curing installations.

Lightweight Aggregates

The demand for lightweight concrete masonry units is increasing rapidly in all sections of the country. The insulating value, fire safety, nailability, acoustic properties, variety of textures and ease of laying block made from lightweight aggregates are the principal factors stimulating their use. It is well known that masons prefer to lay lightweight block.

Table I: Annual production of three major masonry materials

YEAR	CONCRETE BLOCK(a) (MILLIONS OF BLOCK)	CLAY BRICK(b) (MILLIONS OF BRICK)	STRUCTURAL CLAY TILE (THOUSANDS OF TONS)
1925	220	10,037	—
1926	248	9957	—
1927	264	9474	—
1928	254	8825	—
1929	228	7644	—
1930	146	5113	—
1931	87	3218	—
1932	34	1397	—
1933	27	1290	—
1934	35	1404	—
1935	65	2284	—
1936	111	3816	—
1937	123	4191	1353
1938	128	3533	1150
1939	239	4726	1068
1940	263	4079	1035
1941	361	4938	1125
1942	449	3388	1045
1943	282	1918	845
1944	292	1878	716
1945	400	2289	739
1946	940	4869	1273
1947	971(c)	5026	1286
1948	1082(c)	5845	1262
1949	1056(c)	5329(c)	1267(c)
1950	1326(d)		

a-8X8X16-IN. EQUIVALENTS.
b-COMMON AND FACE BRICK.
C-ESTIMATED CONSUMPTION (ACTUAL PRODUCTION VALUES NOT AVAILABLE).
d-ESTIMATED PRODUCTION IN PLANTS OF 500,000 OR MORE CAPACITY.
U. S. Department of Commerce.

A new plant that uses an effective curing system is that of Superior Concrete Products Co., Augusta, Ga. In each kiln is an individual curing unit which consists of a small oil burner, the flame of which burns inside a small combustion tube of a heat-resistant metal. The furnaces (above) are outside and to the rear of each kiln. The burner tube extends into the kiln. Small water sprays are directed onto the outside of the tube, thus generating the steam

Lightweight aggregates in common use are: steam boiler cinders, volcanic cinders (scoria), expanded clay and shale, expanded slag, and pumice.

A relatively new material, expanded perlite, is said to give promise as an aggregate for lightweight block. Perlite is a volcanic rock, mined in a number of western states. When heated to above 1800 deg. F., it expands to form a lightweight, noncombustible, glass-like material with cellular structure. It is about 1/10 the weight of dry sand.

Loomis Coal and Supply Co., Akron, Ohio, is using perlite and gravel as aggregates in a 4-in. partition block made on a Besser Vibrapac. This block is being sold in direct competition with clay tile.

The increasing demand for lightweight aggregates has stimulated research into the characteristics of the available types of such aggregates. It has also concentrated attention on the desirability of finding new types of aggregates and developing a commercially feasible means of producing them.

Probably the most comprehensive study of the possibilities in the artificial production of lightweight aggregates was reported by the U. S. Bureau of Mines in 1948. This was described in the report "Production of Lightweight Concrete Aggregates from Clays, Shales and Other Material."

More recently, in 1950, the Housing and Home Finance Agency sponsored an investigation of lightweight aggregate concretes conducted jointly by the U. S. Bureau of Reclamation and the National Bureau of Standards. The research was concerned more directly with plastic concrete mixes than with the tamped or pressed and drier mixes used in concrete block. However, the information obtained is of considerable value to the concrete block industry because it reflects, in a general way, the effect of aggregate properties on the properties of concrete made with stiffer mixes. The 28-page report is available through the U. S. Government Printing Office, Washington 25, D. C.

Cinder Block

Cinder block producers, especially in the eastern seaboard states, are currently concerned over what they feel is a critical shortage of cinder aggregates. Many steam power plants have converted to non-cinder producing types of fuel such as powdered coal, oil or gas. At the same time there has been a big increase in the consumption of coal to produce electric power. It is pointed out that although there is some actual decrease in the amount of cinders available, the shortage has been due in part to the increased demand for them. Majority opinion in the industry is that cinder aggregates will continue to be important for many years to come.

The development of effective means of treating cinders to prevent staining and pop-outs in exterior cinder concrete walls has been encouraging to cinder block producers. A cinder treatment process based on the findings of three years of research, conducted by the Portland Cement Association in cooperation with the cinder concrete industry, is reported to be in successful operation at the plant of Cinder Concrete Products, Inc., Kansas City, Mo. The original research project was described in detail by the *Journal of the American Concrete Institute*, January, 1948, in a paper by S. G. Seaton, "Study of Causes and Prevention of Staining and Pop-Outs in Cinder Concrete."

The process worked out at Kansas City puts the crushed cinders through a sand washer and dehydrator where they are treated with a solution of limewater. Fifty cu. yd. per hr. of cinders crushed and screened to minus ½-in. are produced. An electric vapor bath to test cinders for potential staining is used in connection with the limewater process. A magnetic separator to remove tramp iron and particles containing magnetic iron compounds may be installed later to supplement the limewater process.

The plant and process are described in detail in a pamphlet by Lawrence Weston of Cinder Concrete Products, Inc., published by the National Concrete Masonry Association. Mr. Weston says: "Based on experience to date, our results have far exceeded our expectations. We have completely eliminated our staining problems and have improved the texture and compressive strength of our finished block product."

Less positive but quite satisfactory results in eliminating the potential staining characteristics of cinders have been obtained by stockpiling crushed cinders in a continuously moist condition for at least 30 days before use. This procedure, employed following use of a magnetic separator, is being adopted by many plants. It is said to reduce the tendency toward pop-outs as well as minimizing staining below the danger point.

A cinder processing plant similar to the one in Kansas City was set up in November, 1951, by Geist Coal and Supply Co. at its block plant in Cleveland, Ohio. This has been in operation too short a time to make a fair appraisal of results.

Pumice as an aggregate for concrete block continues to excite interest. This lightweight material is being used by block plants in Arizona, California, Idaho, Oregon and the state of Washington. Whether its use for block is increasing is questioned by some authorities. In some instances local shortages of other lightweight aggregates have impelled block producers to use pumice. The research on lightweight aggregates sponsored by the Housing and Home Finance Agency included pumice from several different sources. All of these aggregates produced concrete with a compressive strength of at least 1000 p.s.i. and two groups produced 3000-lb. concrete. Good resistance to freezing and

(Continued on page 244)

Many producers have specialized in making precast units on a precision basis to meet architects' specifications. H. A. Van Loon, Bishop, Calif., has developed a pumice wall and ceiling tile unit shown here which embodies new ideas in masonry construction.

READY-MIXED CONCRETE PRODUCERS' DILEMMA

Variables affecting the uniformity of concrete as delivered constitute the most complex problem for the industry

By E. L. HOWARD*

Fig. 1: Highway transport truck unloading cement at Pacific Coast Aggregates, Inc., batching plant

OUR THANKSGIVING TURKEY came from grandpa's farm. It was a fine bird and was raised in a concrete hen house built some 25 years ago. We built with concrete because we had a lot of gravel from the cesspool excavation. The cement came from a nearby mill and some of it I swept from the warehouse floor and from broken sacks piled in a back storeroom. All this "cement" we shoveled into tubs and barrels and hauled off to the farm. I remember that the neighbors came over to help and everyone was satisfied that we had done a fine job. But try as I will I can not remember mention of unsolved problems or difficulties. [We asked Mr. Howard to write this article stressing unsolved difficulties—EDITOR'S NOTE.] The farmers I lived with had never heard of slumps, F.M.'s, water-cement ratios, nor any such important stuff. Chances are they would not have recognized an inspector if one had come around properly labeled.

Much evidence can be produced to prove that good concrete was made in grandpa's day. Inspection and control was not the common thing it is today. Problems just were not known. Uniformity from batch to batch was no problem because grandpa just ignored it. The concrete he made was very good for the hen house job. Grandpa was a good workman and he was blessed with much common sense and plenty of time. He had the cream of the material deposits to use. As a result many of his jobs are a credit to his workmanship.

Today, a score of years later, we work from the same deposits of sand, gravel and cement that furnished grandpa his material. Instead of hen houses and sidewalks we build housing projects for many thousands of people and miles of highways and bridges. This greater requirement from depleted pits has multiplied our problems and we no longer can ignore them.

The ready-mixed concrete industry has filled the need for concrete on the big and small job at the least expense to the builder. The impossible in concrete work in grandpa's day is a common thing in this day of bunkers, scales and trucks. Yet after all these years we have not completely mastered the art of producing truly uniform concrete. We can not always predict just what our finished product is going to be. Specification agencies have complicated the problem even more by differing requirements for similar work (Fig. 3). The most confusing part of all is the efforts of inspection people, job foremen, et cetera, to describe a satisfactory concrete.

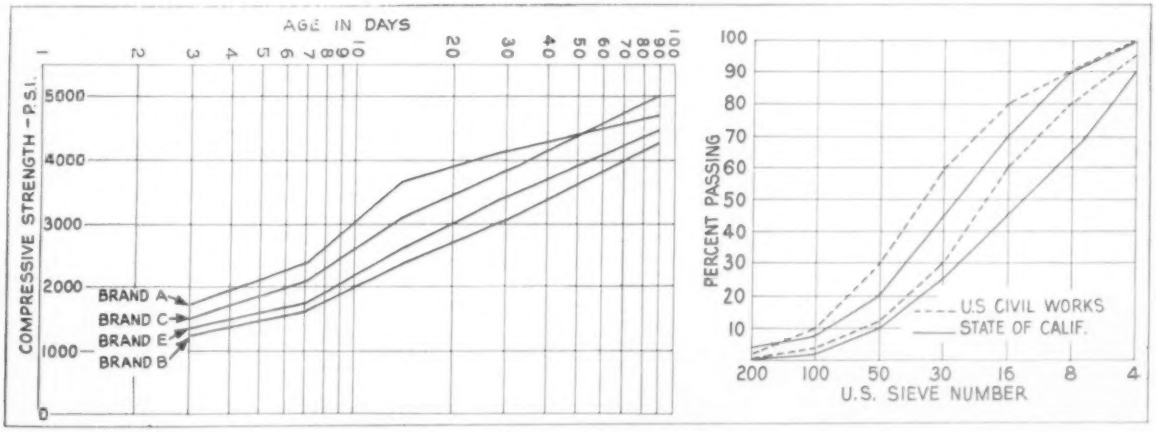
Some commendable work has been done in organizing data to help the man designing concrete. He can, using water-cement ratio and other tables, set up batch weights that under normal conditions will produce the kind of concrete he wanted. The joker is that normal conditions are quite often not the elements of his job.

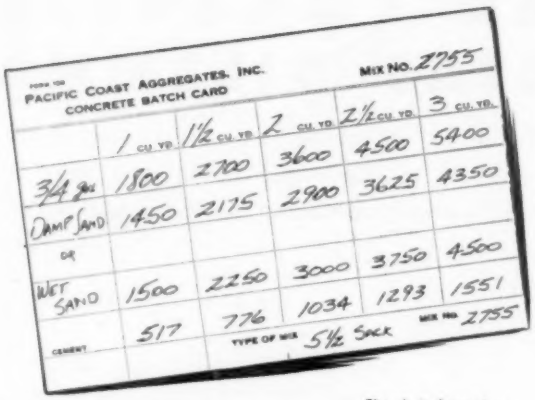
Cement

Supposing our friend used the A.C.I. water-cement ratio table. He would have decided that he should get 3000 p.s.i. compressive strength in 28 days with 7¼ gal. of water per sack

*Pacific Coast Aggregates, Inc., San Francisco, Calif.

Fig. 2 (left): Comparative compressive strengths of concrete using several brands of cement in 5½-bag mixes at 5-in. slump, ¾-in. maximum aggregate. Fig. 3 (right): Two specifications for similar work





PACIFIC COAST AGGREGATES, INC.
CONCRETE BATCH CARD

MIX NO. 2755

	1 CU YD	1½ CU YD	2 CU YD	2½ CU YD	3 CU YD
¾" GR	1800	2700	3600	4500	5400
DAMP SAND	1450	2175	2900	3625	4350
OR					
WET SAND	1500	2250	3000	3750	4500
CEMENT	517	776	1034	1293	1551

TYPE OF MIX 5½ SACK MIX NO. 2755

Fig. 4 (above): Concrete batch weights kept on cards for each job provide quick and easy reference

Fig. 5 (left): Transit - mixed concrete being unloaded at the job; aim is to keep the concrete uniform

of cement. Not all brands of cement meet the normal conditions of our friend's design. With what we shall call Brand A, his concrete will yield 4000 p.s.i. But with Brand E or G he will have to change his water-cement ratio to 7 gal. per sack of cement to get the desired strength. The several brands of cement of our acquaintance will yield 3000 p.s.i. compressive strength with ratios of 7 gal. to 8½ gal. per sack of cement. And to complicate matters more, one brand of cement may require more water for a given slump than another brand (Fig. 2).

If our friend can not be sure of his cement, he must use a conservative water-cement ratio, at the expense of the customer, of course. There is a possibility that because of cement shortages and silo facilities at the batching plant, cement brands will be changed or mixed from time to time. We have found that some cements may be mixed without trouble, but others, especially light and dark, will cause flash set, excessive shrinkage and poor consistency control.

The rapid handling of cement from the clinker to the batch plant has resulted in high temperatures on delivery. In the hot dry areas of the West this has added many problems in the placing and curing of the concrete. It has been observed by laboratory and field tests that a summertime concrete made with 200 deg. F. cement is poor concrete and sets in one-half the time of concrete made with 70 deg. F. cement. In the same concrete three times as many cracks will develop in the first mix as in the low temperature mix.

Should our friend decide to add an air-entraining admixture to the design, he must expect some variation with the use of more than one brand of cement. Concrete using Brand A with an air-entraining agent added at the batch plant will have 3-6 percent air while Brand C in similar concrete mix design will entrain 5-9 percent air. The uniformity of air in the concrete using any brand of cement is usually plus or minus 2 percent. Under ideal conditions and control and low air content a little better uniformity can be obtained.

Aggregates

In choosing the aggregates for the job, chances are high that, contrary to grandpa's system, our friend will ask for a material much different from the natural material in the deposit. Whether he can get what he wants depends upon the equipment in the producer's plant and the pit from which he must work. For the purposes of this writing we will assume that he can get it, but hasten to add that no two sand-gravel deposits will yield the same. He will be wise to get his material from a constant source for the sake of uniformity.

When the aggregates are delivered to the batch plant this man with the design will likely discover that he is not getting in the mix the same stuff the gravel producer promised him. Handling the aggregates from mill to stockpile to weigh hopper, unless done with great care, changes the grading of the aggregates. Table I illustrates this increase in fines because of breakage. The analyses shown here are from actual job samples and are representative of the aggregate found in western river deposits. The amount that the aggregate will change depends in a large measure upon the breaking and chipping characteristics of the material.

Bunkers in batch plants may not be loaded properly to prevent segregation of the aggregates. Table II is data averaged from 50 samples taken from one job and illustrates the problem of segregation. Inspectors on this job complained that they seldom had in their concrete the material called for in the design. Yet all mill tests showed the aggregate to be uniform and within the specifications. Proper chute arrangements at the batch plant were the answer to this particular problem but did not completely stop breakage and separation.

Table II. Gradings of aggregates taken at the weigh hopper

Sieve	Minimum percent passing	Maximum percent passing	Average of all samples
1¼	98	100	99
1	68	87	76
¾	13	35	20
½	2	6	4

Our friend will have calculated the amounts to be added to dry weights because of moisture. The amount of water to add will be given to the batch man. But he finds that the moisture in his aggregates changes faster than he can measure and record the percentages. This condition makes consistency control almost an impossibility. We have discovered that draining sand in a stockpile overnight or 24 hr. insures uniform sand moistures, provided the sand is not drawn from a tunnel beneath the pile. In this case the water has accumulated in the lower level of the pile and this wet sand will be loaded non-uniformly as the drier sand caves down from above. A transferred pile of sand, that is, sand cast over from its original location some few hours before loading, will seldom give trouble in moisture control. Our friend's inspector at the batch plant must be wary of that first load or two in the morning because no matter how long sand has drained in the stockpile, water will accumulate just over that batch gate. We have found that even from gates made to carry away the dripping water, sand above that gate will hold as much as 12 to 18 percent moisture while the sand higher in the bunker will have 6 percent moisture.

If the gravel is delivered in gondola cars there is seldom enough free water to cause trouble in the mix uniformity. But in this day of truck delivery direct from the washing plant very wet gravel is common. The fast highway transport trucks (Fig. 1) we use double on cement hauls at times. For this

Table I. Grading changes of 1½- x ¾-in. aggregates due to handling

Sieve	Specifications on job	Percent passing at mill	Percent passing at stockpile	Percent passing at batch plant
1½	90-100	100	100	100
1	20-55	40	51	59
¾	0-15	8	14	18

reason the dump gates are very tight. Free water that would be lost via gondola now is held until the destination. Some gravel plants in this area provide drainage bunkers for the gravel to get rid of excess water before loading.

A gadget will someday be perfected to measure with accuracy and speed the moisture changes. Until that time we use two systems depending upon the job specifications. We can have a technician assigned to constant duty at the batching plant to measure the moistures and calculate the changes in batch proportions for the operator. With all of the known devices for such measurements too much time is taken to make every batch right without delays in loading at the plant. We more often leave it to the judgment of the operator whether the sand is wet, damp or dry. He uses the mix prepared beforehand for 12, 9 or 6 percent moisture in the sand. The gravels in this case are considered wet (3 percent) or dry (1 percent).

Batch weights should be prepared by our friend on a card or other device easy to see and that can be readily at hand (Fig. 4).

Let us hope that the design calls for an admixture that we can measure into the weigh hopper. Many a job has been impossible to do right because the admix was added to the load in something resembling an old coffee can. Not all batch plants are equipped to measure more than a few of the many admixtures on the market. It is far more important to use one that can be quickly and properly measured than one because of its brand name.

After our friend has somehow satisfied his specifications, his next big job is to satisfy the customer and the men on the job.

Mixing

The mixer truck backs up to the forms and starts to unload. The first yard is just right—then the concrete becomes harsh and rocky. Somebody remarks that the sand is too coarse, and another blames the difficulty on the cement. The real trouble maker is most likely the mixer or maybe the manner in which the materials are charged into the mixer.

We need much more information about the reasons for mixer inefficiency. An extensive research in this field would be definitely subtractive to the unsolved problem department. We do know that poor maintenance of mixers will result in low efficiency. But even well-kept mixers will produce non-uniform concrete from time to time. It will be noted in Table III that the concrete from the front, middle and back portions of a mixer may be quite different. In this table we have shown typical examples of the good, poor and fair mixer efficiency ratings. A poor mixer will not deposit on the job concrete that our friend has designed. Suppose he has calculated a paste (cement plus water) content of 21 percent. He figured the sand to be 47 percent of the total dry aggregate. From a poor mixer his concrete might vary from 7 percent to 28 percent in paste content from beginning to end of discharge. Perhaps in a well controlled operation (Fig. 5) no more than one in ten mixers could be classified as poor. However, when the inspector takes his samples from that one truck (he seldom takes them from portions of the whole load) those cylinders and that slump will be evidence used to condemn larger portions of the job.

Fig. 6: Making a consistency test with the Kelly ball

Table III. Mixer efficiency test data

Mixer rating	Good	Fair	Poor
Percent paste			
In design	21	21	21
In front portion	20	20	28
In middle part	19	26	7
In back portion	21	21	15
Percent sand			
In design	47	47	47
In front portion	46	45	32
In middle portion	44	52	56
In back portion	48	44	38

Testing

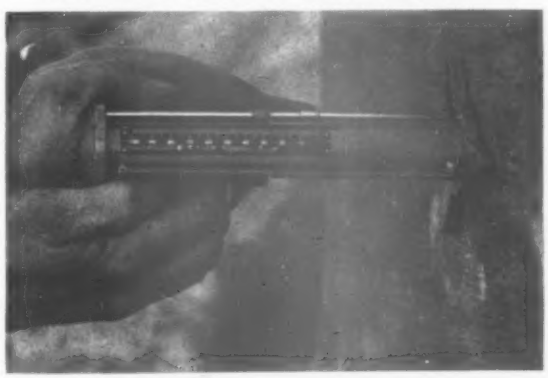
The inspector on the job has been instructed by our friend to use the methods of sampling and testing that have been made standard. Let us hope that he does faithfully use these methods. It has been our observation that not least among all the unsolved problems is the one of getting qualified inspectors on the job.

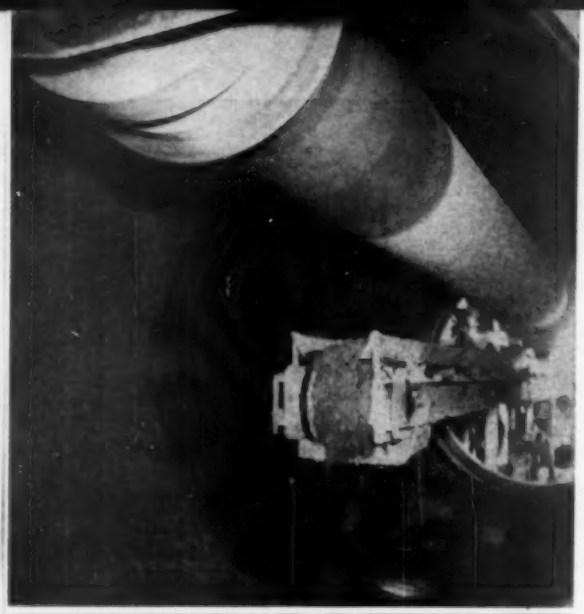
The tests, carefully made, may not always reflect the true qualities they are designed to measure, and they may take too much time to complete. A slump test will require at least ten minutes to take properly and unless the job is held up the mixer truck has discharged its load, another has almost finished dumping and several may be en route with an undesirable concrete. New methods of tests, therefore, are being sought to improve these measures of quality. The common measure in our organization for concrete consistency is the Kelly ball (Fig. 6). Prof. J. W. Kelly of the University of California introduced this ball test sometime ago and we have used it in the field for the past two years. (See "Simplified Method for Measuring Consistency of Concrete," by J. W. Kelly and Norman E. Haavik, ROCK PRODUCTS, May, 1950, pages 130-131). Consistencies can be measured with the Kelly ball in a matter of seconds and the simplicity of operation causes no delays to the job. Tests can be made in buggies, forms, slabs or any convenient place. The ball needs to be placed upon the concrete and the penetration observed. The penetration can be translated into terms of slump by multiplying the penetration by the factor 2. We believe the ball is an accurate measure of consistency.

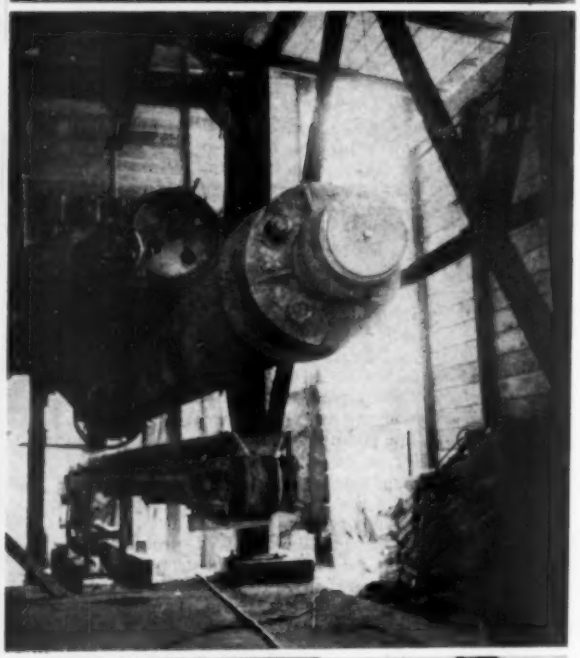
One of the unsolved problems on some jobs is how to get properly made and carefully protected concrete cylinder specimens. Cylinders improperly taken and cared for that test below specifications can and do cause expensive trouble a month after the concrete has been placed. If our friend with the

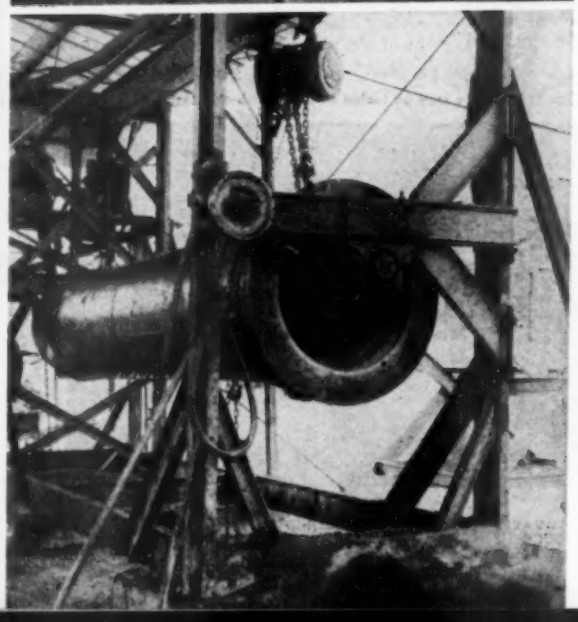
(Continued on page 254)

Fig. 7: Concrete may be tested in place with this test hammer









Applying Basic Engin ee Concrete Unit N

Recent developments in use of prestressing, semi-dry mixes and curing contribute to improved concrete units and structures

By M. W. LOVING

WHEN JOSEPH ASPDEN, the bricklayer of Leeds, England, discovered portland cement in 1824—128 years ago—he really started something; Aspden discovered that by mixing in specified proportions finely pulverized chalk and clay, burning them at a high temperature and grinding the resulting clinker, he was able to produce a hydraulic binding material far superior to any product known before.

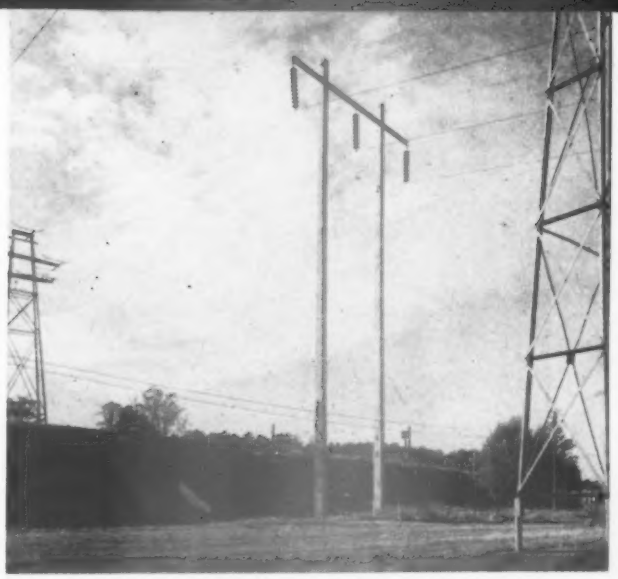
The superiority of portland cement was first established by John Grant, engineer of the Metropolitan Board of Works, when he used portland cement concrete in the construction of the London drainage canal. After this, the factories that had been producing natural or Roman cement changed over to the production of portland cement.

Natural cement had been used by the Egyptians as long ago as 3600 B.C., which is the approximate date of the pyramids. The early Egyptians used a lime-mortar in their constructions and traces of this mortar have been found between the massive stone block with which the pyramids were built. Traces of a similar mortar have been found in Greece and Italy. The Romans used lime-concrete when they pioneered the science of water supply in the construction of the great aqueducts; also for many of their great buildings, including the dome of the Pantheon in Rome, which after more than 2000 years is said to be in a remarkable state of preservation.

The invention of reinforced concrete is officially attributed to Monier of France, who in 1867 embedded a network of wires and rods in concrete, although the Romans had used rods in concrete slabs, or embedded tile in the concrete mixtures.

Top: The roller-suspension machine used by Preload Central Corp. to manufacture the concrete cores for 5200 ft. of reinforced prestressed concrete water pipe. The molds weighed about 4500 lb. and the concrete about 10,000 lb. The semi-dry concrete was fed into the revolving mold with a belt conveyor. Center: The 16 ft. long suspended roller, which was 16 in. in diameter, is illustrated. When suspended on the roller, the weight of the mold and the concrete consolidated the concrete mixture which had a water-cement ratio of only 0.266. The natural vibration of the mold on the roller actually aids in this consolidation. Bottom: The roller-suspension machine at Bayou Concrete Pipe, Inc., Houston, Texas, plant. A 24 in. diameter, 12 ft. long reinforced concrete pressure pipe of conventional design had just been made. The mold revolves at a rim speed of about 500 to 600 f.p.m. The concrete mixture is always uniform because there is no separation of the cement, sand, coarse aggregates and water during pipe manufacture

gin eering Principles to nit Manufacture



Prestressed concrete electric line poles 69 ft. long with a top section of 9.7 x 11.6 in., bottom section of 21.6 x 11.6 in., at Stockholm, Sweden. The poles were manufactured by Aktiebolaget Betongindustri, Stockholm

It was not until about 1900 that portland cement, and reinforced concrete, became generally used in the United States. The fundamental research in reinforced concrete was conducted at the University of Illinois under the able direction of the late Prof. Arthur N. Talbot; at Purdue University under Prof. W. K. Hatt and at the University of Wisconsin, under the direction of the late Prof. F. E. Turneaure and Prof. M. O. Withey. Two of Professor Talbot's assistants at the University of Illinois were Duff A. Abrams and Harry F. Gonnerman; these able men, more than anyone else, are responsible for the basic research in and development of reinforced concrete in this country. What has been done since the early days have been improvements in, and relating to, the manufacture of portland cement, concrete and reinforced concrete; even prestressed concrete is an old subject—except in this country—as is noted later. This article will disclose some of the most recent developments in precast reinforced concrete units of conventional design and prestressed; what has been said and done in the past has not been overlooked.

Effect of Water on Strength of Concrete

In the April, 1917, issue of *Concrete Highway Magazine*, Duff A. Abrams, professor in charge of the Structural Materials Research Laboratory, Lewis Institute, Chicago, Ill., said:

"The exact amount of water corresponding to the maximum strength of concrete will vary with the method of handling and placing the concrete. Any method which involves puddling, tamping, rolling or vibration, or the exertion of pressure in any manner, will have a tendency to increase the strength of the concrete regardless of the amount of water used. However, it is probable that the effect produced by these methods will be more pronounced in the consistencies in the vicinity of the maximum strength.

"Few engineers or contractors realize the disastrous effects which are certain to accompany the use of too much mixing water. We frequently hear the following reasoning:

1. The excess water does no harm because it runs off and evaporates.
2. While very wet concrete is weak at early ages it gains in strength more rapidly than the drier mixes.
3. The rich mixes used in road construction are less affected by excess water.

"The experimental work carried out in this laboratory and elsewhere show that none of these conclusions is correct. The use of excess water produces concrete which is inferior for all mixes at all ages."

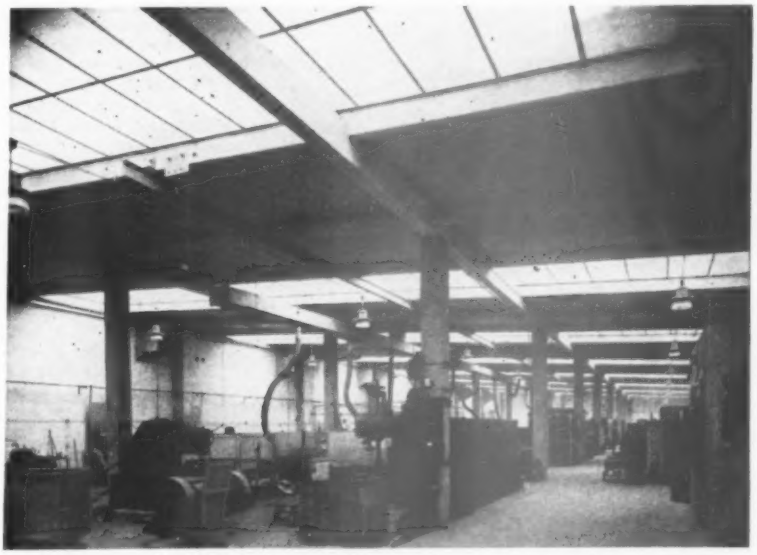
If more attention had been given to Professor Abrams' advice, since 1917, we would have less defective concrete roads and structures of many kinds. Moreover, we would be driving over more older concrete pavements, long since covered with asphalt. It is also true that adequate drainage of the subgrades for concrete pavements was overlooked; today, every important highway is provided with adequate drainage structures.

Professor Abrams' advice was not overlooked in Sweden, Australia, India, France, Switzerland and many other countries. The engineers and manufacturers set to work developing ways and means of processing and consolidating the semi-dry concrete mixtures; out of this came precision vibration and rolling. It seems strange that the latter methods were predicted by Professor Abrams in 1917; so far as I know, vibration of concrete mixtures was initiated about 1926 and rolling dry concrete mixtures, ten years later, in Australia.

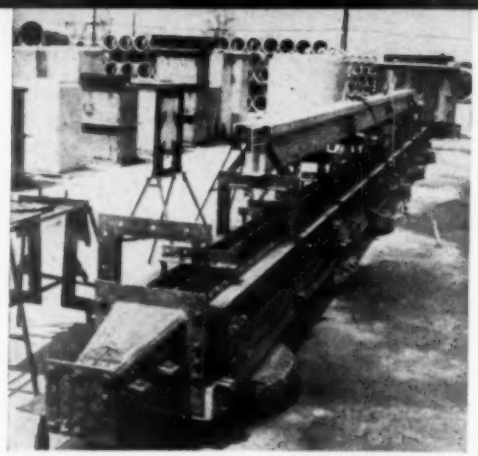
The obvious reason why the semi-dry concrete mixtures have not been used in this country is because the equipment used to mix and place concrete is designed for the wet or plastic concrete mixtures. An engineer friend of mine from Bombay, India, in 1948, after he had seen a lot of concrete work in this country, said: "You are riding around in 1948 automobiles and making 1908 concrete."

Mixing Semi-Dry Concrete

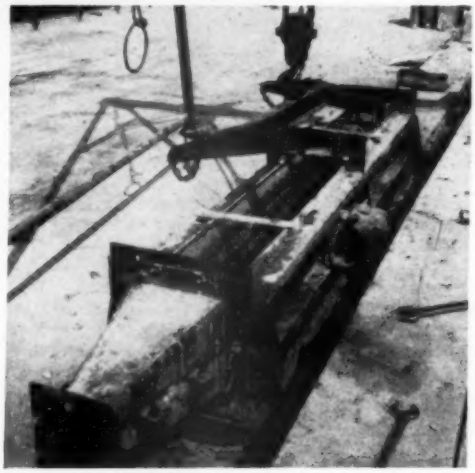
Unlike the wet or plastic concrete mixtures where an excess of mixing water is used, the semi-dry concretes must be mixed in a paddle-type concrete mixer. To assure the uniform dispersion of the cement throughout every batch of concrete, the cement,



Interior of industrial building in Sweden showing prestressed concrete roof beams and girders



Manufacture of 40-ft. reinforced concrete piles at Mid-South Concrete Pipe Co., Memphis, Tenn. The master mold is shown here mounted on and securely fastened to the concrete pallet which rests on used truck tires. Ten Swedish external vibrators are used, five clamped on each side of the mold. The master mold is removed almost immediately after concrete placement



The mold and reinforcing assembly ready for concreting of a 10½-ft. pile with a 14- x 14-in. cross section. For the shorter pile, three external vibrators are used

This picture was taken one minute after the vibrators were started. The mold was filled with a semi-dry, no-slump concrete. The workman is using a wood stick to press the concrete into the point of the pile, which is tapered

After about 8 min. of vibration, during which time the upper surface of the pile is finished with trowels, the master mold is removed. During summer months the piles are covered immediately with burlap cloth which is kept wet; during winter months the piles are steam cured under canvas covers. The next day they are stored and kept wet for several days

sand and coarse aggregates should be dry-mixed for at least two minutes; after the required amount of water is added, the concrete should be mixed at least two more minutes—the longer the better, within practical limits. Also, be sure to remember that the average workman operating a concrete mixer, like most of us, has no conception of time. Thus some timing device should be installed nearby, so every batch of concrete is mixed for at least four minutes or longer.

The mixers must have sufficient capacity so that there will be no interruption of production schedules. At Bakersfield, Calif., in September, 1951, Stroud and Seabrook installed two 40-cu. ft. capacity paddle-type concrete mixers in their pipe plant. One will dry-mix the concrete for at least two minutes; the other paddle-type mixer will mix the batch from the first mixer when the water will be added. When properly mixed concrete is processed, by vibration, rolling or any other method or process, it will have a uniform quality.

Processing Semi-Dry Concrete

For more than 40 years, concrete pipe and drain tile have been manufactured in this country with semi-dry concretes; and in the past 25 years or more, reinforced concrete pipe have been manufactured with semi-dry concrete mixtures—with machine-tamped and packer-head machines. In ROCK PRODUCTS, May, 1951, page 131, the article "Impermeable Concrete Pipe," disclosed the development and actual operations of the new Cen-Vi-Ro process for the manufacture of reinforced concrete pressure pipe at Nampa, Idaho.

When the author was in Nampa in March, 1951, the concrete mixture consisted of 70 percent coarse aggregates and 30 percent sand, with only five bags of cement per cubic yard of concrete. Since then, they have been able to process concrete mixtures, using 75 percent coarse aggregates and 25 percent sand, with an average water-cement ratio of 0.35. Using only four bags of cement per cubic yard, they have produced concrete with a compressive strength of 7000 p.s.i. at 14 days. By using five bags of cement per cubic yard of concrete, and the same proportions of fine and coarse aggregates, they have produced concrete having a compressive strength of 9000 p.s.i. at 28 days.

These are not laboratory experiments but actual production results; since operations were started at Nampa, in March, 1951, they have sold nine complete manufacturing plants to other concrete pipe manufacturers. Three of these new plants are now in operation. So, you can see that it is profitable to pay some attention to what Professor Abrams said in April, 1917.

Rocla Roller-Suspension Process

About 1936, the semi-dry concrete mixtures were processed with bottom-

rollers and the centrifugal process, with jolting—not vibration. About 1948, Rocla Pipes Ltd., Melbourne, Australia, developed the roller-suspension process. Pipe was first made with it in this country at Waco, Texas, in 1948, by the Texas Concrete Works. The following year, this process was used in Chicago, Ill., by the Preload Central Corp., Kansas City, Mo., to manufacture 5200 ft. of 54-in. diameter reinforced prestressed concrete water pipe. The pipe were manufactured in 16-ft. lengths, with shell thicknesses of only 3 and 4 in.; about 1000 ft. of this pipe were provided with steel cylinders, lined with 3 in. of concrete on the roller-suspension machine. The remainder were manufactured on the same machine and consisted of concrete cores, 16 ft. long and with a shell thickness of only 3 in. in most cases and a few with shell thicknesses of 4 in.

The compressive strength of the concrete processed by the roller-suspension machine ranged from a minimum of 8200 to 11,300 p.s.i.; the compressive strength of the concrete was determined with standard cylinders, made with the concrete mixtures and cured with the pipe. It is of interest to note that the average concrete mixture consisted of:

Portland cement, 3 bags = 282 lb.
Sand ..... = 223 lb.
Coarse aggregate (slag) .. = 800 lb.
Water, 3 gal. per bag of cement ..... = 75 lb.

To obtain the absolute weight of the materials, free of any voids, multiply the specific gravity of each material by the weight of one cubic foot of water:

Material	Sp. gr.		Weight of one cu. ft. water, lb.		Absolute weight, lb.
Cement	3.15	x	62.5	=	197
Sand	2.65	x	62.5	=	165.5
Slag	2.20	x	62.5	=	137.5
Water	1.00	x	62.5	=	62.5

To obtain the absolute volume of the 3-bag concrete mixture, used by Preload, divide the total weights by the absolute weights:

Cement	282/197	= 1.431 cu. ft.
Sand	223/165.5	= 1.348 cu. ft.
Slag	800/137.5	= 5.810 cu. ft.
Water	9/7.5	= 1.200 cu. ft.
Absolute volume of batch		= 9.789 cu. ft.
Water-cement ratio	= 75/282	= 0.266 cu. ft.

To obtain the number of gallons of water used per bag of cement, multiply the water-cement ratio by the weight of one bag of cement (94 lb.); then divide by the weight of one gallon of water (8.33 lb.):

$$\frac{0.266 \times 94}{8.33} = 3.0 \text{ gal. of water per bag of cement}$$

To get the number of batches per cubic yard of concrete, divide the number of cubic feet in a cubic yard by the total, absolute volume of the batch:

	27/9.79	= 2.76 batches per cu. yd. of concrete
and	2.76 x 9	= 24.8 gal. of water per cu. yd. of concrete
also	2.76 x 282	= 776 lb. of cement per cu. yd. of concrete
thus	776/376	= 2.06 bbl. of cement per cu. yd. of concrete
		= 8.24 bags of cement per cu. yd. of concrete

Finished 40-ft. reinforced concrete piles, with 14- x 14-in. cross section, stored in the yard of Mid-South Concrete Pipe Co.

The accompanying pictures show how the concrete cores for the 54-in. diameter and 16-ft. long reinforced prestressed concrete pressure pipe were manufactured on the Rocla roller-suspension machine in Chicago in 1949.

The same process is now in actual production for the manufacture of reinforced concrete pressure pipe of conventional design, in diameters from 12 to 24 in. and in 10- to 12-ft. lengths by Bayou Concrete Pipe, Inc., Houston, Texas.

Freyssinet Process for Prestressed Pressure Pipe

In ROCK PRODUCTS, September, 1944, page 81, an article by this writer described Freyssinet's methods of manufacturing reinforced prestressed concrete pressure pipe. This is a complicated and expensive method; but concrete of extraordinary strength and density was processed by vibration, compression and steam curing at high temperature. While a plastic concrete mixture was used at the outset by Freyssinet in Paris, France, the excess water was removed from the shells of the concrete pipe by great pressure during vibration, and means were provided so the water could escape during the actual manufacture of the pipe. At the same time, the steel wire reinforcement was stressed to the required degree. It took about 3½ hr. to make the pipe which were 19.68 ft. long and 31.5, 47.24 and 55.13 in. in diameter. The shell thicknesses of the pipe were only 1.97, 2.44 and 3.15 in. thick for the respective diameters above. The chief engineer of the Montreal Water Board, Canada, and his principal assistant who had seen this pipe made by Freyssinet, told me in 1947 that they had seen some of the 80-cm. diameter (31.5 in.) and 6-m. (19.68 ft.) long pipe tested under an internal hydrostatic pressure of 1000 p.s.i., without leakage. Remember, this pipe had a shell thickness of only 1.97 in. (5 cm.).

Freyssinet's work is mentioned here again, just to show what can be done in the manufacture of concrete of extraordinary quality. It may also be said that it is only possible to produce these high-strength, dense and impermeable concretes in tubular units because it is possible, or rather practical, to exert the tremendous forces required.

Curing Concrete

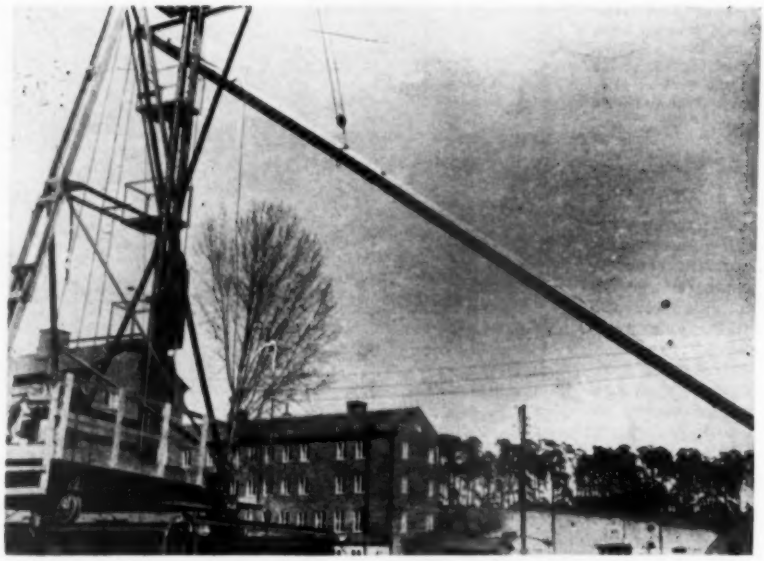
No matter what the strength, density and impermeability of the concrete may be, or the process used to consolidate it, curing with steam, water, water-spray or a combination of these methods still remains of major importance and should never be neglected. Besides, steam curing has other advantages; the expensive molds can be removed without injury to the units, provided proper handling facilities are provided to remove the molds and handle the pipe. Moreover, the mixing water is required to properly hydrate the cement and should not be allowed to evaporate. Curing prevents the evaporation of the mixing water and besides, the higher temperature of steam curing (from 100 deg. F. to not more than 150 deg. F. and a relative humidity of 100 percent) actually accelerates the hardening of the concrete.

Freyssinet was able to completely hydrate the cement in his reinforced prestressed concrete pressure pipe in about 3½ hr. The late A. J. Boase and F. R. McMillan, who witnessed the manufacture of this pipe in Paris in 1936, told me about this. Others have been able to produce pipe of excellent quality in long lengths and remove the molds in about 2 to 3 hr.; I saw this done many times at Nampa, Idaho, with the Cen-Vi-Ro process, in March, 1951.

But in every case, or when any process is used to consolidate the concrete, it is always necessary to test the pipe or other units at frequent intervals to be sure of the uniform quality of the units. With reinforced concrete pressure pipe of conventional design, or the concrete cores for prestressed concrete pressure pipe, it is good practice to steam cure the units while in the molds and after they are removed for at least 20 hr. It is also desirable to keep the units constantly wet for several days. This is required under most specifications.

Reinforced Concrete Piles

In ROCK PRODUCTS, December, 1948, page 196, was a description of the manufacture of drain covers of a complicated design for the Naval Air Sta-



This prestressed concrete pile is 72 ft. long and has a cross section of only 7.9 x 7.9 in.; manufactured by Aktiebolaget Betongindustri, Stockholm, Sweden

tion at Memphis, Tenn., by Mid-South Concrete Pipe Co., of which Lloyd M. Parker is president.

In a recent conference with several engineers of the Research and Geology Division, Bureau of Reclamation, I mentioned how Mr. Parker was able to consolidate the semi-dry concrete mixtures used in the manufacture of reinforced concrete pile with Swedish external vibrators. They said the same vibrators had been tried out in their laboratory and did not come up to the standards of the vibrators made in this country. While this may be true, I have never seen any external vibrators which would process these semi-dry, or earth-moist, concretes like Mr. Parker has been able to do at Memphis. (The pictures of precast pile manufacture were taken at the Mid-South Concrete Pipe Co. plant.) While Mid-South has been producing pile in 40-ft. lengths with one master mold and six reinforced concrete pallets, all resting on used truck tires, it was producing the 14- x 14-in. pile in 10½-ft. lengths when these pictures were taken.

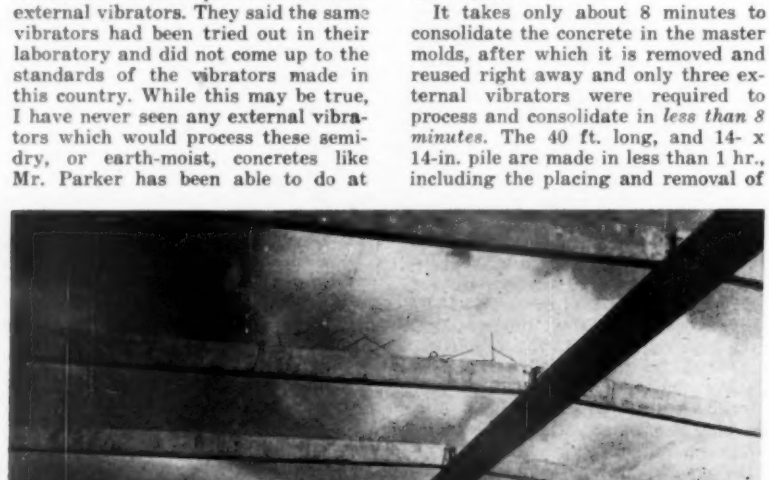
It takes only about 8 minutes to consolidate the concrete in the master molds, after which it is removed and reused right away and only three external vibrators were required to process and consolidate in *less than 8 minutes*. The 40 ft. long, and 14- x 14-in. pile are made in less than 1 hr., including the placing and removal of the master mold to the next pallet. Ten vibrators are required to process and consolidate the concrete because of the longer length.

In the case of the reinforced concrete pile, no effort has been made to set up plant and other facilities for mass production as the demand does not justify such action. As the demand increases, and when it may be decided to produce prestressed concrete pile, it only becomes necessary to provide more concrete pallets and facilities for handling.

Mr. Parker has also been producing reinforced concrete pipe by processing and consolidating the semi-dry, or earth-moist, concrete mixtures for more than two years—five days per week. For this purpose he uses ordinary tamping machines converted for external vibration of the molds; no tamping of any kind is used. Reinforced concrete culvert pipe (A. S. T. M. Designation C 76-41, Table I) are manufactured in diameters of 24 to 36 in. in 6-ft. lengths; the diameters from 42 to 60 in. are manufactured in 4-ft. lengths—all with elliptical steel reinforcement, accurately placed and braced against the steel core of the tamping machine. The dry concrete mixture is fed into the molds as they revolve around the core of the machine; the external vibrators are secured to each half-section of the molds. Just as soon as the concrete is placed and vibrated the steel core is removed vertically, the same way as if the concrete had been tamped, and the new pipe is transported to the curing rooms in the usual manner when the external mold is removed right away.

Because the steel reinforcement is accurately placed in every pipe and remains in its proper position, and the bond strength of the concrete to the steel reinforcement is perfect and the maximum, test results of the pipe at seven days exceed the specification requirements for 0.01-in. crack and ultimate load by 10 percent when tested by the standard three-edge method. Moreover, the actual production of pipe in any diameter is greater than they were ever able to accomplish with tamping and the costs are also much lower than by tamping.

The same Swedish external vibrators are used exclusively. The only explanation I have as to the performance of these vibrators is that the frequency and amplitude are properly synchronized so that these semi-dry concrete mixtures are processed and consolidated in a short period of time, so the expensive steel molds can be used again right away. In the case of the piles, the use of the used truck tires under each pallet prevents dissipation of the vibration into the concrete floor.



Erection of prestressed concrete roof beams for one of the many industrial buildings erected in Sweden that have used prestressed concrete to advantage

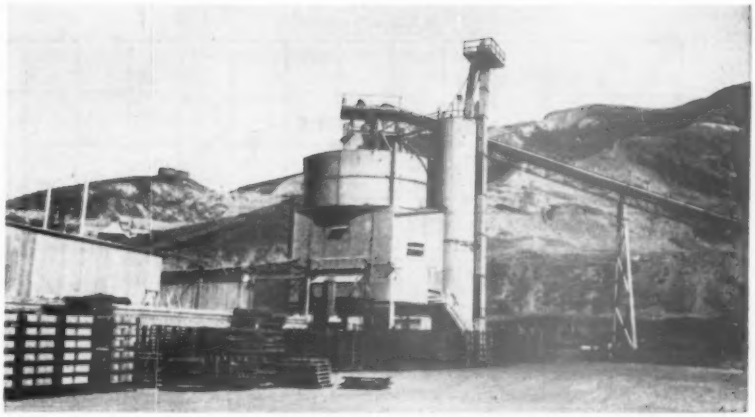
Prestressed Structural Units

As said in the introduction of this article, prestressed concrete is not a new idea in this country or any-

(Continued on page 254)

Concrete products and ready-mixed concrete producers feel competitive forces. Both industries anticipate high volume in 1952

By BROR NORDBERG



View of a modern plant for the production of lightweight expanded clay aggregate block and precast units—Rocklite Products, Ventura, Calif.

Producers Report Record Sales

PRODUCERS OF CONCRETE PRODUCTS of all classes had excellent volume of business in 1951, according to returns to our letter requesting comments on business conditions, the outlook and plans for plant modernization and expansion. Based on a generous response, principally from concrete masonry producers, which we greatly appreciate, it appears that 70 percent of the companies enjoyed a higher volume of sales in 1951 by comparison with 1950, 13 percent had about the same volume and 17 percent did a lower volume of business. Increases averaged in the range of 20-30 percent and most of the decreases as reported were slight.

As in the aggregates industries, the spread between costs and prices continues tighter but it is even more serious for both producers of concrete products and ready-mixed concrete due to the wide differences in operating efficiency between large concerns and the many smaller ones which constitute the majority.

Some of the smaller producers reported increases in volume as high as 20 percent, yet had profits as much as 50 percent less than in 1950. Others have offset reductions in profits before taxes by greatly increased volume of sales. Many producers reported their largest and most profitable year in history. The number is about equally divided between those who anticipate increased business in 1952 and those who expect lower volume.

Conditions fluctuated widely according to localities in 1951. There has been a decided shift from commercial and residential business to industrial and institutional markets, and into outlets related to defense activities, according to many letters received. Prices generally have remained stable in the face of rising costs and, in some areas, actually have been reduced due to competitive forces. Small producers, in a few cases, are complaining that they must meet the lower prices of large concerns which are starting to reach out from metropolitan areas to widen their markets. An interesting point is that attractive farm markets are being developed by many as a successful offset to decreases in demand from other classes of purchasers.

Plants located in areas where large defense or government dam construction is in progress are profiting from the various auxiliary construction in connection with those projects. We even have an oil boom in South Dakota which will guarantee at least three years of heavy volume for favorably located producers. Notably in Ohio, considerable business had to be refused for lack of cement. High cost of out-of-area cement has also been a factor in competitive selling.

Several producers of concrete masonry units and concrete pipe enjoyed greatly expanded volume in 1951 because their customers rushed construction projects for fear of restrictions to come later, with the result that 1952 volume will be proportionately less. Several producers located in steel centers have gone into the processing of iron ore, presumably into unit shapes, for the blast furnaces.

Concrete Products

Among comments on business conditions and the outlook were the following:

A large producer in the Chicago, Ill., area: "Our volume of business has increased 11 percent over 1950. The prices for 1951 were the same as 1950. Labor costs and materials have increased 10 percent, but these were absorbed by a greater volume of business."

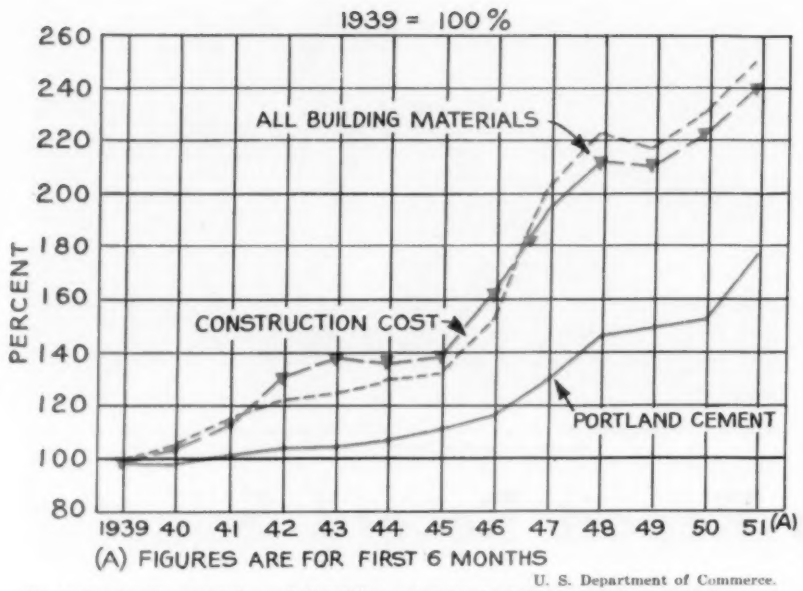
From Michigan: "We experienced 13 percent increase in sales in the first seven months of 1951 over the same period in 1950. Our profits were down by 55 percent for the same period due to higher cost of salaries and not being able to produce accordingly. We do expect to cut this cost for 1952 because of having installed new machinery in 1951, and we expect to do at least 10 percent more business for 1952."

From Ohio: "Our 1951 business was about 10 percent more than 1950. Division of markets showed increase in industrial and institutional branches. Our particular case does not reflect demand too accurately because our cement supply was restricted to the extent that we had to refuse a lot of new business. In 1952 we expect demand to be equal to 1951 in our area. We see no price change for the next 90 days. After that the general wage trend may require a price change of our products, if permitted by controls."

A manufacturer of concrete roof and floor slabs in New Jersey: "About a 100 percent increase in 1951. We anticipate a further increase in 1952. We anticipate our greatest handicap will be shortage of material, particularly steel reinforcing. We expect to modernize and expand our operations."

Rhode Island: "Our 1951 business was slightly better than 1950 in dollar volume. The profits will probably be less because our costs of doing business are higher and our prices are the same as in 1950. We do not divide our sales into various markets because we are identified 100 percent with the construction industry. We expect that our volume for 1952 will be considerably lower than 1951. I see no relief insofar as the price situation is concerned."

A producer of lightweight aggregate in Tennessee: "Our business in 1951 will run about ten times our 1950 business, as ours is a new business which did not get into production until late in 1950. About 90 percent of our 1951 sales went into the production of



U. S. Department of Commerce.

Fig. 1: Construction cost index and all building materials price index compared to portland cement price index—1939 through 1951

lightweight concrete block, with the balance going into lightweight structural concrete and precast concrete work. Sales for lightweight structural concrete are developing quite rapidly and should constitute a considerably larger percent of 1952 business.

"Business in 1952 should run around 50 percent over 1951 as operating problems held production in the early months of 1951 to a low figure. Selling price should remain about the same."

From Florida: "Our volume for 1951 will be as good as 1950—the first eight months were lagging. With the turn of August volume ran ahead of the same months of 1950 due to prospects of restrictions of materials by Washington. Prospects for 1952 aren't any too encouraging in the building field. Priorities on steel and cement along with scarcities in other lines are depressing.

"Generally speaking, there is unrest or a lack of confidence in the present administration in Washington. People are fed up with the Truman 'Or-Deal' and would welcome a change, this change embodying morality in high offices."

From Virginia: "Business in 1951 increased 33 percent over 1950. By markets: farm buildings, 10 percent; homes, 30 percent; government, 20 percent; schools, 30 percent; industrial, 10 percent. We find a 12 percent price increase during 1951. Prices and volume of business should be about the same in 1952 as in 1951.

"The most significant development affecting our business is the scarcity and reduction in quality of cinders. The changing of railroads from coal to diesels and the availability of natural gas on the eastern seaboard has reduced the available cinder supply.

"Although our business increased in 1951 our profit remained the same as 1950. This is due to increased competition and increased maintenance costs, materials and labor. O.P.S. regulations made us absorb too much of the increases."

From Washington (state association): "Washington, generally, is pretty much in a defense area, with a concentration of airports in eastern Washington, a big artillery training range in central Washington, and the airports and Army and Navy installations in western Washington. Business from these sources has helped the slack-off in general building and other types of construction, but it looks as if 1952 will be considerably greater than 1951, at least Army and Navy construction plans so indicate. I believe the products industry has a right, under federal controls, for a small increase in prices, but to date, I don't believe prices have changed."

Handicaps

Manufacturers of concrete products anticipate many of the handicaps listed by aggregates producers, among them being the steel supply, lower profits, decreased efficiency of labor, shortages and delays in obtaining repair parts and labor, government regulations with attendant uncertainties, shortages of cement cars, cement shortages, and price-cutting.

Several manufacturers, notably in Michigan, said that the shortage of skilled building tradesmen is resulting in a diversion to more cast-in-place basements. A manufacturer of concrete slabs expects to be seriously hurt by shortages of reinforcing steel. In a few instances, business is being improved through substitution of concrete for structural steel.

Plant Modernization

Plans for expansion, nevertheless, are going forward as reported by many manufacturers. In addition a number are planning to manufacture new products, including floor and roof systems, septic tanks, etc., for a more diversified line of products. More labor-saving equipment and conversions to more automatic machine production are contemplated.

Among the comments were the following:

From Illinois: "The greatest handicap to doing business in 1952 will probably be labor and possibly a shortage of railroad cars which will make it difficult to get our cement.

"In the coming year we may convert our machinery from semi-automatic to automatic, which will enable us to speed up our manufacture of block and cut down on labor. It will also mean more time for construction work."

From Missouri: "We believe the greatest handicaps to doing business in 1952, are the government regulations. It appears to be too uncertain.

"We do not contemplate any further modernization, or expansion of operations, but to keep what we have in good shape, or replace if necessary.

"It is our opinion that a great part of curtailment in business is caused because people in general are hesitating about going ahead with building or improvements due to the government's uncertainty on controls."

From the Midwest: "Our greatest contemplated handicap for 1952 appears to be supply of cement. If we can get a larger mill allotment, we expect to do at least 25 percent more business.

"We are already enlarging curing room facilities and planning to increase efficiency of curing if equipment can be had. Our inability to obtain natural gas from our local gas company has prevented action on this matter that would have already been done.

"By way of further comment, we are now putting in complete facilities for making, selling and delivering concrete septic tanks. We have made a franchise agreement with the Philip Sitton Septic Tank Co., Dayton, Ohio, to do business under their patents in four counties in Ohio and two in Kentucky. Production is scheduled to start about mid-January."

From Michigan: "Thus far, we have experienced no difficulty in obtaining needed equipment. We do expect there may be some difficulty in the labor situation, and like all other companies trying to do business today, government regulations are a severe handicap.

"This company is now making plans for further expansion of plant facilities, with the thought of increasing production about 60 percent."

From North Dakota: "The greatest handicap in business will be the availability of labor.

"We are planning a 20 percent expansion of our business.

"Due to a recent oil discovery we expect construction to boom for the next three years."

From Washington State: "From all reports, the availability of labor will be the 'hardest nut to crack' in 1952. It would appear that the government regulations, outside of the book work and general nuisance aspects, will not be a serious handicap since our major jobs will be defense projects, and as such, we should be able to get some assistance in obtaining controlled materials.

"It would seem that double shifting in existing plants will be the rule rather than a serious increase in equipment."

Ready-Mixed Concrete

Volume of business done by the ready-mixed concrete industry in 1951 was satisfactory according to letter reports but apparently distribution of business will be spotty in 1952. More than 85 percent of those replying to our letter had a volume of business in 1951 that exceeded 1950 volume, the range being between 1 percent and 40 percent and the average between 15-30 percent. The balance had decreased volume.

Among the more interesting comments were that farm markets had increased and, in a few cases, highway projects were becoming important. Rising costs have been experienced and, in 1951, the higher prices paid for out-of-area cement worked a hardship. Competition is becoming stiffer.

Of those who commented, 30 percent anticipate increased volume of sales in 1952, 25 percent expect equal volume and the balance believe sales volume will decrease.

Among the handicaps to doing business mentioned were the same anticipated by the concrete masonry and aggregates industries. A Mississippi producer has purchased a portable batching plant to operate anywhere in the state to offset a decline in volume otherwise anticipated. There will be considerable modernization and many concerns apparently are planning the installation of bulk cement plants.

Among the comments were the following:

Oregon: "Our 1951 business will about double our 1950 business, split fairly evenly between commercial, industrial and residential. Volume should increase considerably due to start of the Dallas dam construction, necessitating more incidental construction, particularly housing. We hope to hold prices about the same.

"We contemplate addition of a bulk cement plant, improved water system and equipment storage and shop facilities."

Massachusetts: "Our 1951 business represented a slight increase over 1950 both in sales and profits. Judging from the amount of business on hand, our 1952 sales should compare favorably with 1951 although we anticipate profits will be greatly reduced. The greatest handicap to doing business in 1952 will be caused by a sharpening of competition. This in turn is due to the present jitteryness caused by the defense program which it is feared will dislocate business in this area. There is an anticipation that large sums will be spent for defense in concentrated areas, with a general slackening of construction as indicated by N.P.A. wholesale disapproval of building permits. We do not contemplate further modernization or expansion at this time."

New York: "We sell only ready-mixed concrete and do not control our aggregate supply. Our yardage is 10.8 percent above the like period of 1950. The sale price of our product has increased 3.1 percent during the past year, due mainly to the increased cost of cement. We do not anticipate any great price increase during 1952.

"We expect that our volume for 1952 will be considerably less than this year; due to the gradually tightening of government restrictions on commercial building. There is no government building in our area. We do not anticipate further plant or equipment expansion during 1952. The present tax situation is discouraging to legitimate expansion. The incentive to extend one's capacity to gain increased profits is not worth the effort under our present government."

Massachusetts: "Our business in 1951 was off approximately 20 percent in volume from the 1950 total. There was no significant change by markets and the decline for the most part was due in my opinion to the delays and shortages in the supply of steel. We do not anticipate that this condition will improve and the 1952 volume could well be determined by this same condition.

"Reduction in volume has resulted in much sharper competition between dealers and in spite of increased costs, prices have declined particularly on larger projects. Equipment has been in adequate supply and labor has been plentiful. Government regulations have resulted in deferring certain types of construction and we believe that there will be no relief in this regard in 1952.

"We plan no further purchases of new equipment or of expansion in our plant, in fact, capacity use of our present facilities would be our prime problem in the coming year.

"Our experience is typical of dealers in this area and while we are optimistic that work will be plentiful in an election year I believe we are all of the opinion that the peak was reached in 1950 and the volume of business in the foreseeable future will be nearer to normal proportions which existed prior to the boom years."

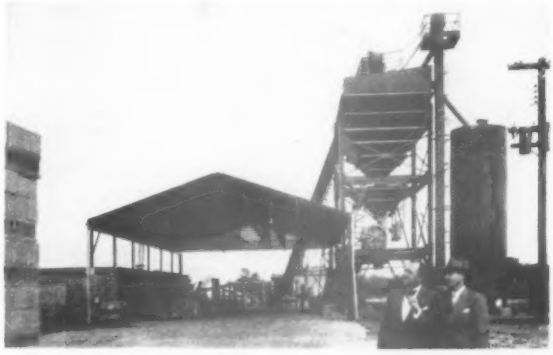
Texas: "Our 1951 volume shows an increase of 28 percent over 1950. For the first half of the year sales were about evenly divided between commercial and residential construction. Since the middle of the year, both commercial and residential markets have fallen off somewhat but this has been offset by the increase in construction activity at the various local military bases. We anticipate a slackening off in volume in 1952 due primarily to governmental restrictions on the building industry. Local prices for ready-mixed concrete should remain on about the same level as in 1951."

Ohio: "Our business for 1951, volume-wise, was about a 40 percent increase over 1950. From a profit standpoint it will probably be about the same as last year in total. Increased labor costs and equipment costs together with the tremendous increased cost of bringing in out-of-area cement to keep up with our requirements, plus the existence of ceiling prices on ready-mixed concrete accounts for the much smaller percentage of profit this year.

"Volume of business expected in 1952? Of course that is the $64 question, what with all the confusion in Washington about controls, allocations, supplying the rest of the world, and what have you. Our best guess at this writing is that our local construction volume will probably recede to about the 1950 level.

"We expect considerable difficulty in getting sufficient help in 1952 to operate our business efficiently. With the usual winter letdown in the construction industry we stand to lose a number of our men this winter who will find employment in defense factories and other places of year around employment. It is a great big question

(Continued on page 258)



One of the new block plants erected in the South is that of Superior Concrete Products Co. Looking to the future, the company plans to make a wide variety of concrete products and not be limited to block alone. More and more producers are following this view and there is increasing evidence of it now

View of discharge of lime putty from continuous vacuum filter into screening hopper. Thickness of lime mat is 1½ in.

Vacuum Processed Lime Putty

Product has superior properties; another advantage is speeded-up production at lower unit cost

By BROR NORDBERG

ACCORDING TO TESTS for plasticity, lime solids and percentage of unslaked material as reported by testing laboratories, the lime putty produced by Colonial Blue Diamond Mortar Corp. by a new process has excellent qualities. The process, known as the M-K patented process, is the only new development in lime putty manufacture since installation of a number of Brooks-Taylor plants in the late 1930's.

It differs in that a vacuum filter is used for dewatering and cooling of the slaked lime as contrasted to the large capacity aging tanks which featured the Brooks-Taylor process. A number of production advantages have resulted along with greatly speeded up operations, and, as proved by test, a product of high quality and great uniformity may be produced without aging.

Until the Brooks-Taylor process was perfected for commercial application, lime putty was traditionally produced in vat-type plants like the one operated by Colonial Blue Diamond Mortar Corp. at Bayside, Long Island, N. Y.

Durando Miller, vice-president of the corporation who, with Thomas R. Komline of the Komline-Sanderson Engineering Corp. is co-inventor of the M-K process, has had a long history in the lime putty business and it was largely his practical experience as an operator that dictated the necessity for an improved process. He was not satisfied with the long time required for dewatering and cooling by previous methods, nor was he satisfied with the uniformity of product attained. His company has in operation, since 1937, one of the largest Brooks-Taylor plants ever built.

For the past 15 or 20 years the aging of lime putty was considered of utmost importance for its effects on plasticity and, until now, the Brooks-Taylor plant has been considered the best method for rapid dewatering and aging of the putty. However, Mr. Miller did not consider the natural cooling in this plant to be sufficiently rapid and had developed a heat exchanger to cool the material before transfer into aging tanks, to be followed by additional cooling and dewatering.

Use of the heat exchanger helped a great deal but the six or seven days required for dewatering and aging was not considered satisfactory. Neither was the degree of uniformity attainable in the product at seven days and even after 28 days. Density varied according to location within the conventional aging tanks. Lime putty around the sand filter drains would differ in density by comparison with that around the sides of the tank while the putty in the center of the tank or far from the filter drains would usually be sloppy and of low lime solids content. It was difficult to produce a lime putty having better than 25 percent lime solids, even when drawn from the most favorable spots in the aging tanks, and there would be variations down as low as 25 percent.

Experimental Work

Experiments were started with a view to correcting this condition and to develop a process which at the same time would be speedier and more economical. A contributing factor was that the existing Brooks-Taylor plant, of 30,000 cu. ft. putty capacity, was insufficient to meet the company's demands for brick mortar, to say nothing of finishing lime putty. The old vat-type finishing lime putty plant at Bayside, Long Island, had been dismantled and it was desired to re-enter that field which required greater productive capacity of a more uniform material.

After several other methods were considered, the vacuum filter idea was tried, and a pilot model plant built by Komline-Sanderson Engineering Co. yielded promising results. The vacuum drum filter is somewhat similar to those used by several wet process cement mills, one of the principal differences being that coil spring wire is used instead of cloth to minimize blinding and disintegration.

Experimental work with the pilot plant had developed that not only could a uniform lime putty be produced of high lime solids content but that the design of the filter produced a cool putty ready for immediate use by the plasterer or bricklayer. Some of the experimental putty actually was delivered within an hour to the plasterer for immediate mixing with gauging plaster and application to the wall.

It had further developed that a lime putty of varying density could be produced at will which is of importance because brick mortar does not require a lime putty of as high lime solids as is required for finish coat plaster. Plasticity was proved satisfactory without aging.

Test Data

Results of tests made to determine whether the putty was suitable for finish coat plaster were reported on September 7, 1951, by the Massachusetts Institute of Technology.

The plasticity figure as determined by Emley plasticimeter according to A.S.T.M. methods was 350 which bisects the limits of 300 to 400, which are considered the most satisfactory range by plasterers. The putty sample as received in the laboratory contained 44 percent solids which is very high and compares with the characteristics of soaked hydrates. Solids were much higher than for normal slaked putty particularly if made from high calcium lime. From this it was concluded that shrinkage and subsequent cracking of the putty during application would be less than for a quicklime putty slaked by conventional methods.

Tests indicated that the putty slakes so that less than 7 percent of

the total lime solids is retained on a No. 200 sieve, whereas a value of 10 percent is considered as excellent. Soundness tests indicated that the putty contained no potential unsound particles. It was concluded, from all the tests, that the putty would make a satisfactory finish coat. Plasterers also have given the product their endorsement.

Plant Operations

The M-K process of lime putty manufacture has been in operation at the company's Astoria, Long Island, plant since June, 1951. Operation of the plant is simple compared to any other process and production does not hinge on having any aging tanks or large storages.

High calcium quicklime is used exclusively at this plant but the process is equally applicable to dolomitic lime. Lime is received at the plant by trucks and is elevated to discharge into an overhead storage tank. A mechanical slaker is directly below the tank. Water is measured by meter and the slaker has a weighing device attached to its discharge gate to measure each batch of lime entering the slaker.

After slaking, the hot milk of lime is put over a vibrating screen with 20-mesh screen cloth to eliminate any oversize and the lime is pumped into the filter vat.

The drum of the filter is made up of coil springs as shown in the illustration and vacuum is applied as the drum slowly revolves in the vat. Lime is picked up on the surface of the drum, in the form of a continuous mat or cake, thickness being controlled by the vacuum applied. At an established point in the travel of the drum, the vacuum is released and then the springs leave the drum and pass over a discharge roller where metal fingers peel off the mat of lime from the springs as finished product. Thus, all the lime putty has been given uniform treatment under closely controlled conditions.

Lime putty is dropped directly into

(Continued on page 259)

Filter drum is covered by stainless steel coil springs which pick up mat of lime slurry from vat. Vacuum pipe are seen at end of drum. This view was taken when unit was not in operation

View of drum taken from the rear and above, showing mat of lime progressing over to discharge end

Underside of slaker, showing vibrating screen and pump which delivers slaked lime into filter vat

Lime putty is discharged from hoppers into delivery boxes which are handled by lift trucks

Lightweight Aggregates for Concrete Masonry

Smithwick Concrete Products summarizes acceptance of expanded shale for precast and monolithic concrete

Home office of Smithwick Concrete Products; office in foreground, block plant to left, and Haydite plant in right background

By S. CARL SMITHWICK*

THE CONCRETE PRODUCTS industry appears to be on the threshold of another new era with the amazing increase in the manufacture of expanded shale concrete masonry. During the past decade, with the increasing use of concrete masonry above ground and in buildings of every type; with the growing demand from the building industry for a block of not only strength and utility but of light weight and with inherent insulation, sound absorption and high acoustical value, the eyes of concrete products manufacturers have been turning to an aggregate which would give them these characteristics.

In 1949-1950 Smithwick Concrete Products, Portland, Ore., designed and built a plant for the manufacture of expanded shale embodying design features which had never before been attempted in this type of plant. (See page 163, October, 1950, ROCK PRODUCTS). Briefly, the Smithwick company is producing 300 cu. yd. of Haydite per 24-hr. day with a single 8- x 100-ft. kiln and with a total payroll, in addition to the quarry operations, of only ten men. The plant is exceptionally clean, as a dust collecting system plus the washing tower render it almost dustless.

Otto C. Frei, formerly president of the Washington-Idaho Lime Products Co. and now vice-president of this company in charge of the Haydite division, was responsible for many of the successful innovations incorporated in the design of the Haydite plant.

The Smithwick company has already been commissioned to design large plants for the manufacture of expanded shale in Kansas and Ohio, based on its original copyrighted design but adapted to meet local conditions. Surprisingly, none of these companies so far entering this field is engaged in the concrete products business, two of them being coal producers and the third in the production of sand and gravel.

The company, in addition to furnishing Haydite for its block plants in Portland and Eugene, is shipping the aggregate to the principal cities of the Pacific Northwest and to Canada to be used in monolithic concrete construction. Included among the more important projects were the deck of the Tacoma Narrows bridge, the 13-story Ridpath hotel building in Spokane, Wash., and various defense projects in the provinces of British Columbia, Alberta and the Yukon Territory. As an example of the versatility of the aggregate, it is also being used for the manufacture of laundry trays, for precast roof and floor slabs, as mortar aggregate and as loose insulating fill.

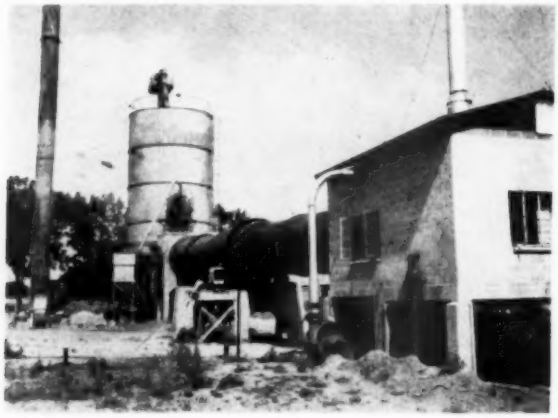
In summary, the following are the principal factors dictating the choice of expanded shales or clays as a source of lightweight aggregate for block manufacture:

1. The stress placed by the building industry on the importance of "built-in" insulation, sound absorption and high acoustical values;
2. The fact that loadbearing block may be easily attained with expanded shale aggregate, and with a higher yield of block per sack of cement;
3. The comparatively light weight of the expanded shale unit, resulting in lower labor costs by reason of increased output per mason. (The 8- x 8- x 16-in. unit in expanded shale weighs approximately 25 lb. compared to 44 lb. for a sand and gravel unit);
4. The recent discoveries of additional deposits of shale in various parts of the United States which have the necessary bloating and strength characteristics, assuring satisfactory aggregate;
5. The increasing scarcity of cinder aggregate, due to the fact that many major industries are changing to powdered coal or oil as a source of fuel;
6. The fact that in strength and volumetric changes expanded shale equals or approaches that of sand and gravel aggregate;
7. The improvements made in expanded-shale plant design, a low-cost, uniformly high quality aggregate.

It is becoming increasingly apparent that with promise of vastly increased facilities for the manufacture of uniformly high quality expanded shale aggregate soon to become available for block manufacture, a new day is dawning for the concrete products industry, and that new and greater and more versatile uses will be found for this material.

*President, Smithwick Concrete Products, Portland, Ore.

The 100-ft. rotary kiln used in the Smithwick plant is one of the longest in the Haydite industry. Silo in the background contains kiln feed stone



THE MARIETTA CONCRETE CORP., Marietta, Ohio, recently started full production at its new precast concrete panel plant at Marietta, said to be the only one of its kind in the United States. The plant, representing approximately a $150,000 investment and designated as a defense plant, produces approximately 4000 sq. ft. of concrete panel per day.

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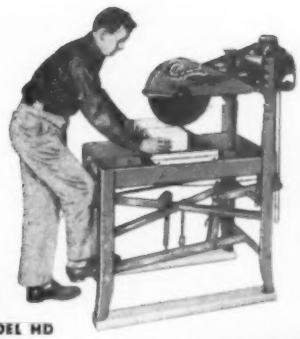

① MODEL HD used as DRY MASONRY SAW

③ MODEL HD "CONVERTIBLE" CART used for SAWING CONCRETE

Four Entirely Different Ways to Profit with Handy CLIPPER "CONVERTIBLE"

④ MODEL HD "CONVERTIBLE" CART used for TRACK SAWING

② MODEL HD used as WET MASONRY SAW

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Makes your blades last longer... Because Equalizer Spring automatically cushions blade pressure whether cutting HARD or SOFT materials. Outstanding for blade economy.

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Pull the knob—and the Cutting Head is free for finger-tip setting at any desired angle. Release the Knob—and Head is locked in the desired position.

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Just turn the Save-A-Blade Dial to the material hardness and the Pressure Equalizer Spring automatically sets the tension—guarantees faster cutting and longer blade life.

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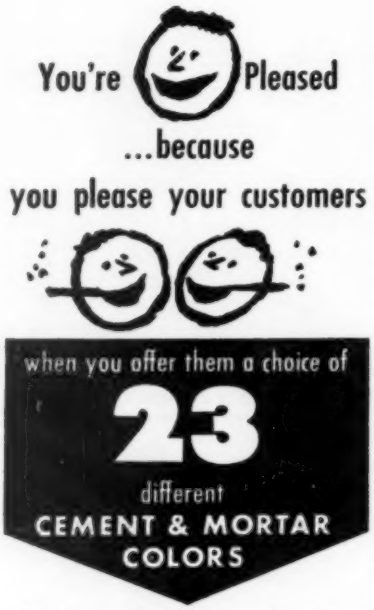

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Concrete Masonry Industry

(Continued from page 228)

thawing was reported but drying shrinkage was considered too high.

The most recent use of pumice aggregate in a block plant is by Cinder Products Corp., Providence, R. I., with 19,000 cu. yd. of pumice imported from Greece, as described in ROCK PRODUCTS, November 1951, page 128.

Within the past few years, the use of expanded clay and shale and expanded slag aggregates by the concrete masonry industry has more than doubled. These two types of aggregate, plus cinders, account for about 50 percent of the total volume of concrete masonry produced.

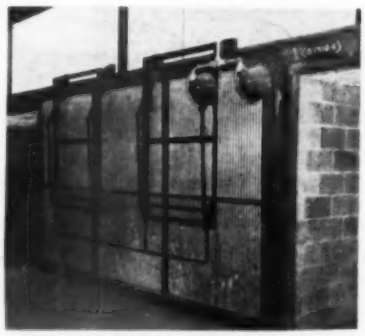
In the H.H.F.A. research previously mentioned, 26 concrete mixtures were tested with expanded clay, shale or slate aggregates. Compressive strengths up to 7000 p.s.i. were obtained. Good resistance to freezing and thawing was indicated.

Expanded slag aggregates were used in 21 different concrete mixtures tested. Air-entraining portland cement was used in all the mixes but one. Satisfactory resistance to freezing and thawing was reported.

Scoria aggregates from one source were also tested and reported as exhibiting properties similar to expanded slag aggregates. Moderate drying shrinkage and good resistance to freezing and thawing were shown.

In the field of the heavy aggregates such as sand and gravel, crushed stone and air-cooled slag, no new developments are reported.

Although there is much evidence that the use of lightweight concrete masonry is on the increase, current government reports indicate that production of heavy block continues to be about equal to production of lightweight block. The extensive government building program and the big volume of school construction which is expected, may put production of lightweight units ahead. On the basis of construction in progress, contracts awarded and projects on the boards, there are predictions that the government will soon be the owner of the largest number of concrete masonry structures in the world.



An important detail of high temperature curing kilns in concrete products plants is to have an effective door seal. The doors shown here are carried by a special "door-carrier" that rides a trolley in front of the kilns. The door is held in place by lugs that make a tight seal

Quality Control

Some of the developments in concrete masonry are concerned with both the manufacture and use of the block. Progress is being made toward control of cracking in concrete masonry walls and intensive research is continuing on this subject. Some of the steps which block manufacturers are taking to prevent cracking have already been mentioned. Of ten crack preventive measures suggested by R. E. Copeland, director of engineering of N.C.M.A., five of them are construction steps or measures in the control of the contractors, engineers or architects.

In line with their determination to produce concrete masonry units of the highest possible quality, a number of manufacturers are installing plant laboratories in order to have facilities for constant check on raw materials as well as on daily production. By this means potential threats to quality can be recognized early enough to avoid making any block which might cause trouble in a wall.

Progress in Floor Systems

Floor systems utilizing concrete masonry units as filler block or soffit block are absorbing a considerable percentage of today's block production. A number of block manufacturers have invested in new buildings and special equipment for the manufacture and erection of floor systems. Some block manufacturers have conducted extensive tests of the behavior of concrete masonry units in floor systems to obtain approval of building code authorities. It is predicted that this use of block will increase as the economy and structural advantages of these floor systems are recognized by architects and engineers.

Prefabricated floor and roof systems have been in use for about 15 years. Filler block have been used for a long time but their extensive use has been in the past ten years. Some plants in the East and Middle West are doing a large volume business in filler block.

Soffit block construction is a modification of the filler block type floor and is a comparatively recent development. The fastest growth in concrete masonry floor systems has come since the end of World War II. More than 60 block plants in 27 states now have molds for making soffit block units.

Economy, fire resistance, load-carrying capacity and speed of erection are features responsible for the rapid acceptance of concrete block floor systems. A minimum of formwork is required and a working deck is quickly provided for other attendant construction operations.

The adaptability of concrete masonry units to radiant heating systems also favors their use in floors. The cores can conceivably serve as ducts for pipe coils. In one heating system

the core spaces of the concrete masonry filler block serve as warm air convectors, thus providing a warm floor and conserving scarce metal ordinarily used for ducts.

Block in Prestressing

The cost differential in favor of precast concrete units as compared with the cubic yard cost of cast-in-place concrete is stimulating use of concrete masonry units in prestressed concrete construction. Concrete block have been used successfully on prestressed bridge decks and girders, stadiums and for prestressed floors and other structural members in industrial and commercial buildings.

At the prestressed concrete conference at the Massachusetts Institute of Technology, August, 1951, Prof. W. C. Voss, head of M.I.T.'s department of building engineering and construction, predicted that assemblies of concrete masonry units will supersede cast-in-place procedure for many applications of prestressed concrete.

Basalt Rock Co., Napa, Calif., is one of the pioneers in utilizing concrete masonry units in prestressed construction. The Basalt company developed a floor and roof system under the trade name of Strestcrete several years ago. The company has since added Strestcrete tongue-and-groove siding for wall assemblies and other products using prestressing. (Some of these developments were described in ROCK PRODUCTS, July, 1951, page 109, and January, 1950, page 197.)

New Types of Block

Some new types of concrete masonry units have appeared in the last year or two to meet the demand for rough textured walls. One of them is being produced under the trade name of Split-Rock. It is based on a patented device developed by Eugene Leipold of Split-Rock Products, Wauwatosa, Wis. This equipment splits solid concrete masonry units produced on any plain pallet machine into slabs of various dimensions without scoring. It is reported that Split-Rock units are now being produced in considerable volume in 15 different plants.

Several other devices producing a similar result are said to be available in different parts of the country.

Another new unit is known as Russ-Stone, described as "a combination of stone and the backup wall." It is made by Russ-Stone Co., Des Moines, Iowa. The face side of Russ-Stone is 1½-in. of cast stone tamped under high pressure. The lightweight backup is cast to the face. It is available in modular sizes, in 4- and 8-in. thicknesses and in various colors.

Slump block, made from a wetter than normal mix and vibrated to produce an irregular face and dimensions, though not new, continues to be currently popular in Florida.

A number of innovations are reported involving surface treatment of concrete masonry units with colored ceramic glazes, plastic glazes or special paints with a portland cement base.

One of the newest and most interesting developments in colored faces for concrete block is known as Spectra-Glaze, being made by General

Not only has handling of block in the plant been modernized, but various types of truck bodies to facilitate fast delivery of block have also been put on the market. The truck above is equipped with a special dump-type body to reduce handling costs at the job

Glaze Corp., Baltimore, Md., licensed under a patented process developed by the Burns and Russell Co., also of Baltimore. General Glaze uses an expanded clay aggregate block produced by the Marietta Concrete Corp., which adjoins its plant. The process consists of heating the cured block, spraying on a ceramic glaze and then heat treating the block in a continuous oven. The glaze, in a variety of colors, is said to be stainproof and permanent. The inventors say the process can be applied with equal success to any high quality lightweight concrete block (see ROCK PRODUCTS, June, 1951, page 182).

Sand and gravel block in red, tan and buff are being produced from natural pigments by Rockford Brickete Co., Rockford, Ill., and others.

Wall and ceiling tile made with pumice aggregate and chemically treated to produce fluorescent colors are being manufactured by H. A. Van Loon at Bishop, Calif.

Fire Resistance Tests

Lightweight concrete masonry units have excellent fire resistant properties according to the most recent fire tests conducted by the National Bureau of Standards in cooperation with N.C.M.A. Fire endurance and hose stream tests were made on 16 walls built of units made with cinder, expanded slag, expanded shale and pumice aggregates. The walls ranged from 3-in. non-loadbearing partitions to 10-in. loadbearing walls. Brick-faced exterior bearing walls were included.

The fire-resistance values shown by the tests ranged from 1 hr. 9 min. for a 4-in. unplastered partition to 7 hr. 3 min. for an 8-in. bearing wall faced with brick and backed with 4-in. lightweight concrete units. Complete details of these fire tests are contained in the report "Fire Resistance of Walls of Lightweight-Aggregate Concrete Masonry Units." Copies are available through the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., for $0.20.

Research in Progress

A wide range of research projects affecting various phases of the manufacture and use of concrete masonry units were underway at the end of 1951 in various colleges and private laboratories.

The National Concrete Masonry Association is financing an investigation of the sound transmission characteristics of concrete masonry partitions at the Riverbank Acoustic Laboratories of Armour Research Foundation, Geneva, Ill.

Investigations are being conducted by N.C.M.A. at various member company plants on curing, drying, effect of mixing time and other manufacturing problems. Also under N.C.M.A. sponsorship, studies are being conducted at the University of Wisconsin on the effect of curing and drying procedure on the physical properties of concrete masonry units.

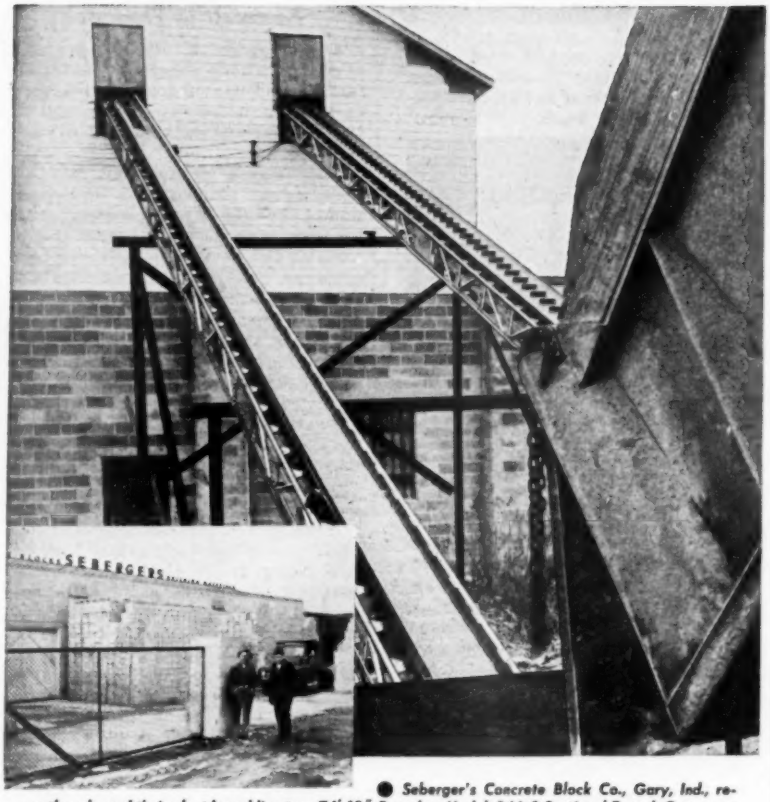
Present testing methods are also under review and some new methods are being tried, notably on sulfur capping of test specimens as contrasted with gypsum and portland cement capping.

Research seeking to provide additional information on factors which influence the resistance of concrete masonry to cracking and means of preventing cracking is underway by the University of Toledo Research Foundation. These studies are being conducted under a contract with the U. S. Housing and Home Finance Agency and the Corps of Engineers. Studies of mortar and coatings for decorating and waterproofing are also being made at the University of Toledo.

Two important research projects concerned with concrete masonry are in progress at the research and development laboratories of the Portland Cement Association, Skokie, Ill. One is on the moisture volume stability of concrete masonry units exposed to various ambient moisture conditions. Another is an investigation of the effect of elevated temperatures and other variations in moist curing and accelerated drying on the physical properties of concrete masonry units.

R. E. Copeland, director of engineering of N.C.M.A., believes that perhaps the most important problem facing the block industry today is to bring about recognition of the fact that concrete masonry has become an important architectural and engineering material. To accomplish this a great deal more technical information is needed, not only by the industry itself but by engineers and architects so that concrete masonry will be manufactured and used in a manner resulting in the utmost satisfaction.

There is need also for increased efficiency in handling and laying block on the job if concrete masonry is to sustain its reputation as the most economical of wall materials. Increased labor restrictions and mounting labor costs are a threat to this economy.



● *Seberger's Concrete Block Co., Gary, Ind., recently enlarged their plant by adding two 74' 18" Farquhar Model 346-2 Sectional Trough Conveyors to feed 250-ton storage hopper. This plant uses one portable and six permanent Farquhar Conveyors in all. (See quotes from letter, below.)*

"We look to FARQUHAR for our CONVEYOR needs!"

Here are quotes from a letter Farquhar recently received from Seberger's Concrete Block Co., Gary, Indiana: " In 1950, we completed 25 years of cement block manufacturing. As our facilities grew, we looked continually to your company to satisfy our conveyor needs. The satisfaction gained since our initial purchase 14 years ago (this first conveyor is still being used to feed our crusher hopper) has been always reaffirmed in subsequent purchases.

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N.R.M.C.A. Safety Contest

TOP HONORS for the National Ready Mixed Concrete Association's safety contest for the period July 1, 1950, to June 30, 1951, in the Class A group (those producing more than 100,000 cu. yd. of concrete) were won by W. E. Anderson Sons Co., Columbus, Ohio, which had an accident-free record for the 12-month period.

In the Class B competition (companies producing from 50,000 to 100,000 cu. yd. of concrete), seven companies had accident-free records, with Eugene Sand and Gravel Co., Eugene, Ore., being the trophy winner. Certificates of Achievement in Safety will be awarded to:

*Eberts Brothers Co., Wyandotte, Mich.
Livingston Rock and Gravel Co., Inc., Long Beach, Calif.
Central Supply Co., Watsonville, Calif.
West Texas Concrete Products, Inc., Odessa, Texas
Acme Ready Mix Concrete Co., Rockford, Ill.
Whitney's, Duluth, Minn.

The Class C competition (companies producing less than 50,000 cu. yd. of concrete) had 33 companies with accident-free records. Standard Roofing and Material Co., Tulsa, Okla., with the greatest combined total cubic yards of concrete produced and man-hours worked among those accident-free companies, will be awarded the Class C trophy. Certificates of Achievement in Safety will be awarded to:

Samuel Braen and Co., Mahwah, N. J.
*Blake Brothers Co., Richmond, Calif.
Tyler Ready-Mix Concrete Co., Tyler, Texas
Newkirk Transit Mix, Inc., Joliet, Ill.
Builders' Concrete, Inc., Muncie, Ind.
Modahl and Scott, Inc., Bloomington, Ill.
*Rock River Ready Mix, Dixon, Ill.
*American Aggregates Corp., Ready Mix Div., Greenville, Ohio
*Stephens Ready Mix Concrete Co., Cairo, Ill.
*Cement-Mix Concrete Co., Erie, Penn.
*Portland Sand and Gravel Co., Portland, Penn.
Pocahontas, Inc., Salisbury, Md.
*The Union Sand and Supply Corp., Painesville, Ohio
Wisconsin Valley Concrete Products Co., Wisconsin Rapids, Wis.
Grand Junction Building Materials Co., Inc., Grand Junction, Colo.
Coon Certified Concrete, Luzerne, Penn.
Mesaba Construction Co., Hibbing, Minn.
*Nelsen Concrete Culvert Co., Inc., Mt. Vernon, Ill.
*Shamokin Ready Mixed Concrete Co., Inc., Shamokin, Penn.
*Mooney Bros. Supply Co., New Castle, Penn.
Helena Sand and Gravel Co., Helena, Mont.
Certified Red-D-Mix Concrete, Lawton, Okla.
*The Trumbower Co., Inc., Nazareth, Penn.
Maysville Ready-Mix Concrete Co., Maysville, Ky.
Ready Mix Concrete Co., Storm Lake, Iowa
Logan Concrete Products, Inc., Logan, W. Va.
*Gethmann Concrete and Material Co., Gladbrook, Iowa
Ready Mixed Concrete Co., Anandale, N. J.
*Monroe Ready-Mix Concrete and Material Co., Monroe, Wis.
Wiltgen Ready Mix Co., Le Mars, Iowa
*Watertown Cement Products Co., Watertown, S. D.
Worthington Ready Mix Concrete Co., Worthington, Minn.

Additional recognition should be given to the 14 companies having asterisks before their names. Each of these companies has had an accident-free record for at least two consecutive years, with The Trumbower Co. maintaining a four-year record, and

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17. Finger-tip control for reversing drum rotation.
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BLAW-KNOX DIVISION of Blaw-Knox Company
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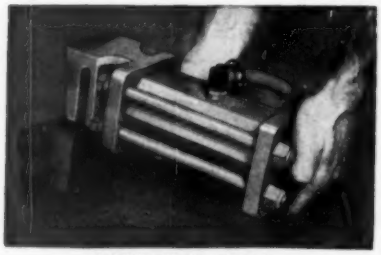
"BRANFORD" Vibrators

Step-by-Step Savings for You with "BRANFORD'S" Big Three

"BRANFORD" STEP 1
Pneumatic Car Shake-Out Vibrator
Low cost portable shake-out speeds up unloading of cement and other bulk materials from covered hopper-bottom railroad cars.

"BRANFORD" STEP 2
Pneumatic Hopper and Bin Vibrator
Assures instant, steady flow of materials from storage bins, weigh batchers, and feed hoppers. Destructive hammering is eliminated.



"BRANFORD" STEP 3
Pneumatic L. D. Vibrator
Produces dense — smooth finished products. Light weight and easily applied at various points for vibrating for concrete pipe, vault, tank forms, etc. Let us quote you on your vibrator needs.
Complete catalog on request.

NEW HAVEN Vibrator Company
145 CHESTNUT ST.
NEW HAVEN, CONN.

Portland Sand and Gravel Co., a three-year record.

In this year's competition, there were 157 companies participating, compared with 133 companies last year. These 157 companies produced 15,511,908 cu. yd. of concrete during the 12-month period ended June 30, 1951.

The trophies and certificates will be presented at the annual convention, Chicago, Ill., February 11-15, 1952.

Naming Contest

THE WINNER of the naming contest sponsored by Chain Belt Co., Milwaukee, Wis., will be announced at the Rex booth the opening day of the National Ready Mixed Concrete Association's convention and exhibit, February 11, at the Conrad Hilton hotel, Chicago, Ill.

The contest is open to any customer or potential customer, or employe of a customer or potential customer, and consists of naming the company's new sizes of Moto-Mixers (the 5½-cu. yd. and 7-cu. yd. Hi-Discharge) and explaining why these names were chosen. The winner will receive two Rex Moto-Mixers, valued at approximately $16,000. All entries must be post-marked not later than February 1, 1952.

Concrete Pipe Meeting

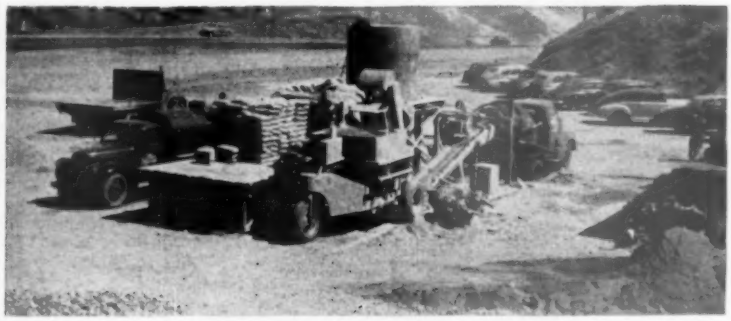
THE WESTERN CONCRETE Pipe Association's annual fall meeting was held in early November at the Hotel Last Frontier, Las Vegas, Nev., with a large attendance reported.

At the directors' meeting, a report submitted by the association's advertising agency was approved, which recommended a total advertising budget for 1952 in the amount of $6026, to be divided between irrigation and drain tile advertisements in farm journals, and culverts, sewers and storm drain advertising in construction and engineering periodicals circulating in the area. The board also authorized further limited tests with the U. S. Bureau of Reclamation at the Fresno, Calif., laboratory, on plain concrete pipe.

At the membership meeting, it was reported that during 1951 eight new active and nine new associate members were added to the membership list, and that a number of new members are to be added to the roster in 1952.

Other reports at the business sessions included a report by members from the state of Washington on research being done by Washington State College on the hydraulics of concrete irrigation pipe; a report by Clint Knoll of the California Association of Employers, who discussed the many problems arising out of the Wage and Hour and Salary Stabilization Regulations and the necessity for careful procedure and record keeping; and a report concerning 1951 inquiries by engineers and other inter-

CONCRETE MIXING IS COMPLETELY MOBILE with



WILLARD CONCRETE MACHINERY

SAVE SET UP TIME and take down time . . . eliminate long hauls . . . and batch-mix at the job with completely mobile Willard Machinery.

WEIGH BATCH LOADER picks up aggregates from stockpiles and weighs to specification.

PORTABLE LOADING CONVEYOR delivers batched aggregate and cement to transit mixers.

TRANSIT MIXERS available in any capacity up to 5 cubic yards.

WRITE FOR "THE WILLARD WAY" BOOKLET

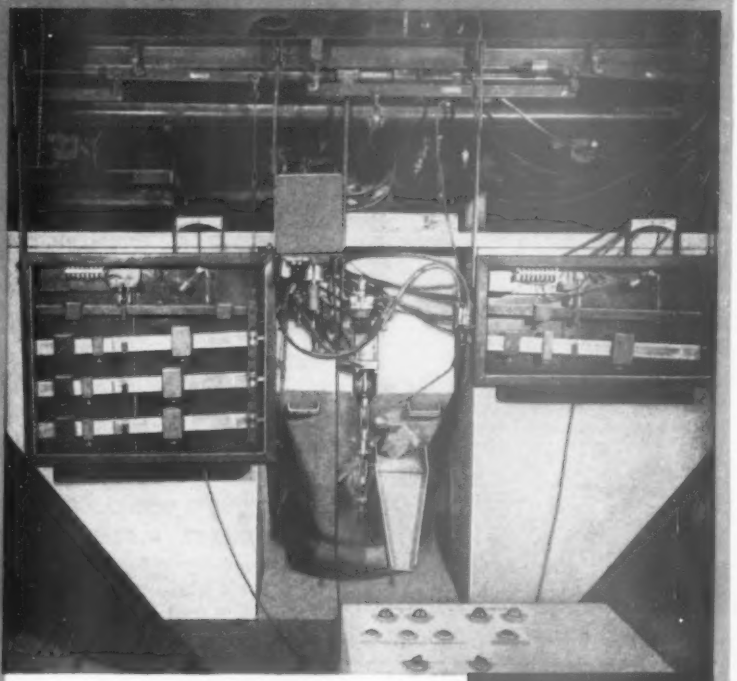
THE WILLARD CONCRETE MACHINERY SALES CO.
2906 Imperial Highway **Lynwood, California**

TON DUMPTOR STRENGTH PER TON OF PAYLOAD . . .
Layered steel-oak-steel bottom, rib-reinforced body, heavily-trussed main frame provide ample Dumptor strength to stand up to severe loading shocks

NO-TURN SHUTTLE HAUL
Koehring constant-mesh transmission gives Dumptor the same 3 fast speeds forward and reverse, eliminates slow turns at the loading unit, an narrow haul roads, and at dumping location.

NO BODY HOIST means no complicated mechanical hoists to slow up haul cycles, no costly hoist replacement parts with Koehring Dumptors. Gravity dump is always instantaneous, trouble-free . . . no mechanical parts to wear out.

CENTRAL CEMENT FEED with Johnson Concentric Batcher



● Central cement feed with Johnson Concentric Aggregate-Cement Batcher prevents "gumming", reduces dusting, pre-shrinks materials. All ingredients are intermingled as they flow through discharge.

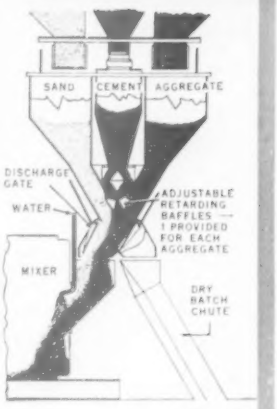
● Cement, concrete's most expensive ingredient, is weighed individually on precision-beam scale in a separate batcher hung within the aggregate hopper. Aggregates are weighed on accumulative dial scale, or on individual weigh-beam scales.

● Adjustable rate of discharge of each aggregate permits accurate ribbon-feeding . . . cement flow cuts off just ahead of final weight, prevents overshooting.

● Dual discharge is available for charging 2 stationary mixers, or 1 stationary mixer and a truck mixer or dry-batch truck.

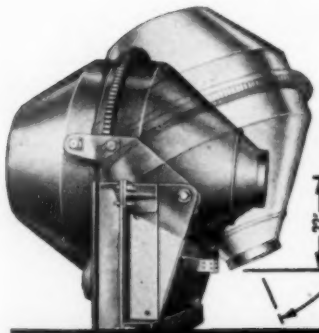
● 2 to 5 cu. yd. sizes can be arranged for 2 to 4 aggregates, plus 1 or 2 types of cement . . . have fully-automatic, semi-automatic or manual controls. Let your Johnson distributor show you all the production advantages you will .get with one of these patented Concentric Batchers in your plant.

Automatic
AIR-RAM OPERATED
Finger-tip panel controls air rams on aggregate and cement fill valves and discharge openings . . . provides fully automatic operation . . . assures extreme accuracy at top batching speeds. Batcher also can be furnished with semi-automatic or manual controls.



C. S. JOHNSON COMPANY
(Koehring Subsidiary) CHAMPAIGN, ILLINOIS

CONCRETE PLANTS • BINS • HOPPERS • ELEVATORS • SILOS • BUCKETS



TILT-UP

CLEAN UP with

FOR CONVERTING TO CENTRAL MIX

As it requires less headroom, the TILT-UP SuPREMIXER is the only mixer feasible in most plants. It's easy to install, no raising of the plant or lowering of drive.

FOR A PACKAGE PLANT

Reduced headroom requirement means reduced height, construction and power costs. Efficiently permits dry batch in one lane, central mix in the other.

FOR A SEMI-PORTABLE PLANT

Crane feeding is easy with SuPREMIX. Separate A-frame mounting with bin structures bolted for quick, easy set-up provide real flexibility for your rush defense jobs.

Only the SuPREMIX TILT-UP, 3-3½ yard hydraulically controlled mixer can give you *all* these advantages: lower headroom requirements—steeper discharge of 65°—no segregation—reduced thrust—and virtually fixed discharge. The hydraulic system is part of the unit—no costly compressor to buy. The unique features of this mixer make it the ideal mixer...

New TILT-UP Bulletin shows complete details; write today.

SUPREMIX
ADRIAN MICHIGAN

402 GRACE ST. • ADRIAN, MICH.

An Affiliate of GoCorp

DISCOVER FOR YOURSELF HOW YOU CAN SAVE ON BAGS, LABOR, TIME, MONEY !

Baughman

"Hi-Speed"

BULK CEMENT TRANSPORT BODIES

Avoid the business loss and inconvenience of haphazard rail deliveries . . . prevent inventory tie-ups resulting from larger-than-required rail shipments . . . stop limiting your business location possibilities to rail sites. Cut out your bag costs . . . save time, labor and money.

Handle cement the modern way—in BULK! This SELF-UNLOADING Baughman body is designed and built for high speed, low cost loading, hauling and delivery. Saves in every way—there's a size for your requirements. Full details sent on request. No obligation. WRITE TODAY!

BAUGHMAN

BAUGHMAN MANUFACTURING CO., Inc.
1111 Shipman Road, Jerseyville, Ill.

"There is a Baughman Distributor Near You"

ested parties, for literature, specifications and other information on concrete pipe.

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A. M. Herman, Concrete Conduit Co., reviewed the new tentative drain tile specifications C 4-50 T, commenting that although they were not in his opinion completely satisfactory, they were a considerable improvement over the old specifications written in 1924.

Mr. Peckworth reported that the industry has been placed in a more favorable position regarding the allotment of reinforcing steel for concrete pipe, but said that it was difficult to say whether sufficient steel would be available to all. Members were advised to file their applications for 100 tons or less of steel per quarter, through the field offices of the Department of Commerce, and for larger quantities, direct to Washington, or through Mr. Peckworth.

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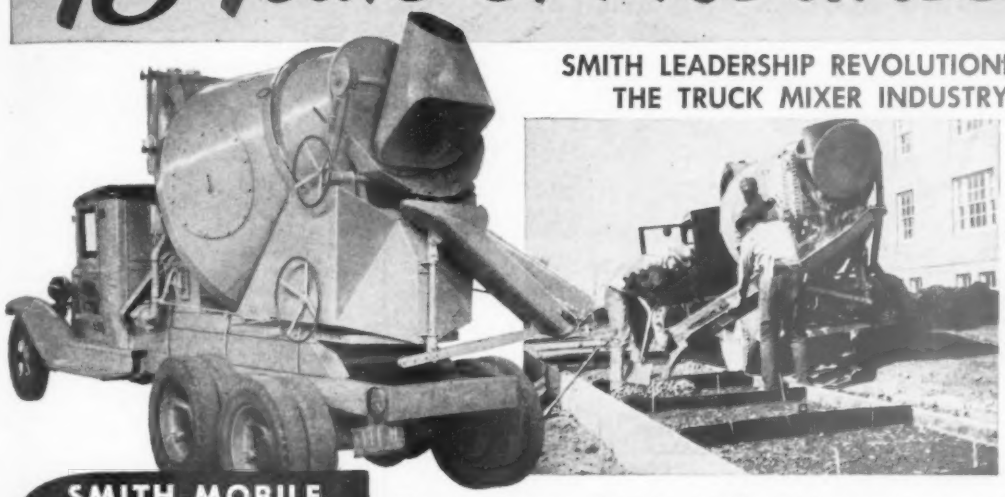
Concrete Roofing Tile

A NEW CONCRETE ROOFING TILE which was originated in Australia will be manufactured and distributed in Florida by Maule Industries, Inc., Miami, and Cement Block Industries, Tampa, which have been licensed by the inventor, George Agar, Melbourne, Australia.

The Besser-Agar tile has been in use in Australia and New Zealand for 14 years. It is applied to wood strips nailed across the rafters. Each tile is fastened to the strips on the underside with heavy wire. It is a flat-type tile that interlocks four ways and when properly applied is said to form a watertight roof, requiring no protection underneath. The inventor states that this type of construction requires "no sheathing, no felt and no mopped-on slate." It is said to have withstood all typhoon and cyclone disturbances in Australia and New Zealand.

The two companies which will manufacture and distribute the tile have investigated and tested the product for some months. Maule Industries has installed a machine made by Besser Manufacturing Co., Alpena, Mich., which produces 24 tile per min. Another such machine is to be installed at Cement Block Industries' plant at Tampa. The company has already contracted to cover 40 roofs with the Agar tile.

15 Years of PROGRESS



SMITH LEADERSHIP REVOLUTIONIZED THE TRUCK MIXER INDUSTRY

An early model Smith-Mobile working on Greendale Housing Project near the city of Milwaukee, in 1937.

SMITH-MOBILE
Early Model Built in 1937

1st in the Field

FIRST high discharge truck mixer.

FIRST to eliminate the need for hoist or ramp.

FIRST with a controlled discharge.

FIRST to provide visible mixing.

FIRST with feed chute charging.

FIRST to provide for shrinking and mixing of batch as materials enter drum.

FIRST to introduce water through the feed opening.

FIRST to provide water injection through both ends of drum.

FIRST steep distributing spout, especially ideal for dry concrete.

FIRST to announce fluid drive as standard equipment.

FIRST with LOADLIMIT models.

1952 Model
SMITH-MOBILE

You want the very finest truck mixer that money can buy. You get it in the Smith-Mobile.

Rome wasn't built in a day. Nor was the modern Smith-Mobile evolved overnight. It was designed around basic Smith inventions and patents long before anybody else built high discharge truck mixers. Important refinements were added from year to year, all based on intensive research and practical experience gained in the field.

Today, Smith-Mobile continues, as always, to be the acknowledged leader in the industry. Buy Smith-Mobile and be sure you are getting the best. Five sizes available. Standard or LOADLIMIT models.

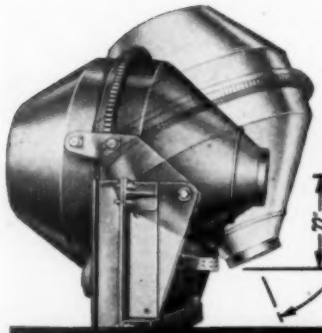
Write for descriptive literature.

THE T. L. SMITH COMPANY, 2885 N. 32nd Street, Milwaukee 45, Wis.

SMITH MOBILE

The Original High Discharge Truck Mixer and Agitator

A-6019-1P



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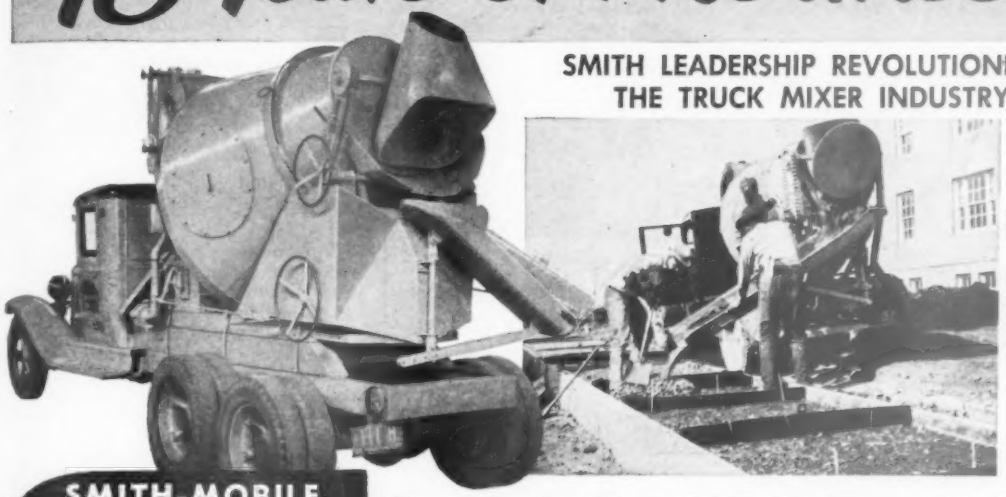

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A 6019-1P

PUSH BUTTON UNLOADING

FOR BUILDING BLOCKS AND BRICKS!

Reg. U.S. Pat. Office

REHBERGER UNLOADERS QUICKLY PAY FOR THEMSELVES IN TIME AND LABOR COSTS SAVED!

Rehberger Unloaders combine these exclusive advantages: one man operation; increased loads; reduction of unloading time; same number of blocks delivered per day or week with ½ or 2/3 less number of units.

The only successful unit of its kind. Rehberger Unloaders have been time proved on the job by numerous companies with fleet and single installations. They are built for all makes of tandem axle trucks. No help is needed. Unloading time is reduced to minutes.

Reduce your costs with Rehberger Unloaders. Write for full information now.

ARTHUR REHBERGER & SON, INC.
320 FERRY STREET, NEWARK, NEW JERSEY

VEHICLE ENGINEERS FOR 66 YEARS

You too, can take it easy and bask in the sun by letting our **Marvel Jr. Drain Tile Machine** work for you. **Turns concrete into gold** and pays for itself in a few days plus profit.

CONCRETE MACHINERY COMPANY
HICKORY 5, NORTH CAROLINA

WRITE TODAY FOR DATA

ROCK PRODUCTS FEATURES TIMELY INDUSTRY NEWS EACH ISSUE

Ready-Mixed Concrete

(Continued from page 231)

concrete design is wise he will hire only qualified inspectors, pay them well, and insist on good work. If a cylinder breaks low in seven days, the concrete represented by the specimen may be tested in place with a concrete test hammer. The results will show quickly whether the cylinder was truly representative of the concrete in place.

It has been quite a trip from the slide rule to the forms for our friend's concrete mix. The trip was successful and peaceful if all those concerned with it used common sense and honest pride in their work. Good concrete can be made and is being produced by reputable ready-mixed concrete companies every day. We will produce better concrete than we have ever made and at less money than we now spend when we have answered some questions about cement, found the answers to moisture changes in aggregates, discovered the causes of mixer inefficiency, and trained technicians to measure the qualities of concrete accurately without lost time on the job.

Applying Engineering Principles

(Continued from page 236)

where else. However, it is in actual production and extensively used in Europe while little has been done in the United States and Canada. A patent specification was issued to P. H. Jackson, San Francisco, Calif., in 1886 for prestressed concrete units and structures; and in 1928, a patent was issued to R. E. Dill, Alexandria, Neb., for post-stressed concrete units with unbonded steel.

In the October, 1944, issue of ROCK PRODUCTS, page 109, the article " 'Concrete-Steel' Pressure Pipe for Water Supply," described the manufacturing methods of J. E. Miller, Lewistown Pipe Co., Hillside, Ill., who produced this kind of prestressed pipe for Hammond, Ind., in 1938; Chicago, Ill., in 1942-43; and for the Standard Oil Co., Wood River, Ill., the same year. The basic research was conducted at Purdue University under Prof. Ray B. Crepps. All together, about 48,300 ft. of this kind of pipe were manufactured and installed; the pipe ranged in diameter from 24 to 42 in. and were made in 12-ft. lengths. These pipe lines are in excellent condition today.

To show what can be done with prestressing, structural units of all kinds are manufactured and used in Sweden. From 1943 to 1947, more than 500 industrial buildings were erected with the use of "wire-concrete" roof beams. Piles, poles for transmission lines, I-beams, slabs and precast units of every kind are manufactured with prestressed concrete.

In June, 1948, Ulf Bjuggren, Ak-

Towmotor Certified Job Studies show how other companies in *your* industry, with problems just like *your* problems, have cut production costs, increased output per man-hour, handled more tonnage . . . SAVED MONEY IN EVERY WAY . . . with Towmotor Mass Handling. Packed with helpful information, and illustrated with on-the-job photos, Towmotor Certified Job Studies clearly picture BIG SAVINGS on those jobs with which YOU are most familiar.

Look at these typical TOWMOTOR SAVINGS

- *Car unloading costs cut as much as 70% in many plants*
- *A big appliance manufacturer cut handling costs 65%*
- *75% of floor area saved with high stacking*
- *Breakage eliminated in a bottled goods plant*
- *Carloads of steel unloaded in 1¼ hours—saving 87%*
- *A retail warehouse saves $635 weekly*
- *A canned goods warehouse cut car loading costs 75%*
- *An auto parts maker saves 160 man-hours weekly*
- *Storage capacity doubled in many warehouses*

See how YOU can reduce costs in all phases of Receiving, Processing, Storage and Distribution. Write today for Job Studies covering your industry.

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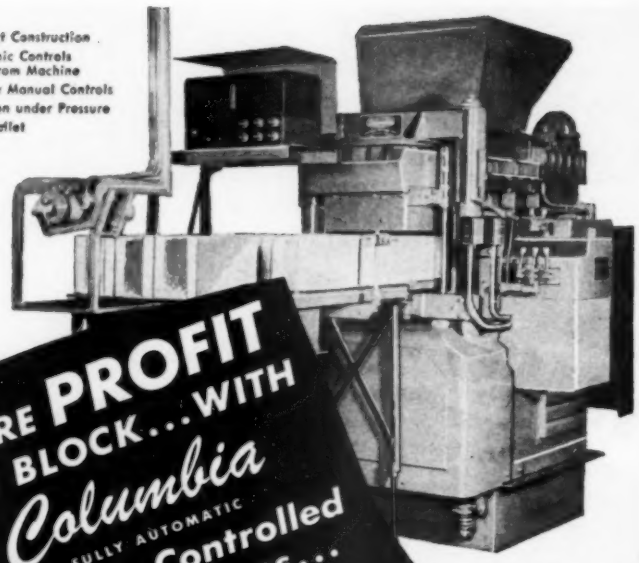
THE ONE-MAN-GANG®

FORK LIFT TRUCKS and TRACTORS
RECEIVING • PROCESSING • STORAGE • DISTRIBUTION

HOW MANY PEOPLE HAVE YOU TALKED TO ABOUT AMERICANISM TODAY?

- Compact Construction
- Electronic Controls Away from Machine
- Standby Manual Controls
- Vibration under Pressure
- Plain Pallet



MORE PROFIT PER BLOCK... WITH Columbia FULLY AUTOMATIC Electronic Controlled Block Machines...

4 TO 6 CYCLES A MINUTE WITH Columbia AUTOMATIC CONTROL

LOW COST initial investment backed with low cost maintenance and rugged dependable construction means a wider margin of profit for the operator. Fully automatic with electronic controlled valves offers a flexible operation obtained in no other machine. Compare Columbia feature for feature... you'll buy Columbia!

Look at these features:

● Electronic controls... away from vibration yet within easy reach of the offbearer. ● Rugged, dependable plain pallet machine. ● Electronic controlled valves afford unheard of flexibility. ● Finger tip controls allow 4 to 6 cycles per minute. ● If necessary, manual operation instantly available. ● Vibration under pressure with electronic controlled oscillation and timing of the feed drawer. ● Blocks ahead of any machine of comparable production capacity! ● Approved and proven by successful operators throughout the country!

Write home office for name and address of sales representative in your area.

Columbia MACHINE WORKS

107 S. GRAND AVE. VANCOUVER, WASH.

tiebolaget Betongindustri, Stockholm, Sweden, sent the author information and data on these various units and a number of pictures, several of which are reproduced for this article. At the time, I was under the impression that some American and Canadian manufacturers could be interested in manufacturing some of these units. But after these many years, I have been unable to interest anybody in the subject. All of the basic research was conducted in Sweden and at the Federal Laboratory for Testing Materials, Zurich, Switzerland. Not only was the concrete investigated, but round, square, twisted and notched steel wire cables were investigated in detail. Thus, no one can say that the Swedes engaged in this business without the required research and development work; it would seem to me that some practical use could be made of this research and development work in this country—not duplicate it and take 25 years to do so.

Many say that prestressing is too expensive for this country and can not compete with steel and reinforced concrete precast units of conventional design. This was partly because we could get all the steel we needed—but try to do that today. The market exists; read this:

". . . More than 300 engineers attending an all-day conference on prestressed concrete in Albany, N. Y., last week heard Bertram D. Tallamy, superintendent of the New York State Department of Public Works and president of the American Association of State Highway Officials, urge use of prestressed concrete to alleviate the shortage of structural steel. Cited in discussion was a school building using prestressed beams that required less than 10 percent of the steel for rolled beams and less than 20 percent of the steel for reinforced concrete beams . . . concrete requirements were reduced one-third. . . ."—*Engineering News-Record*, November 22, 1951.

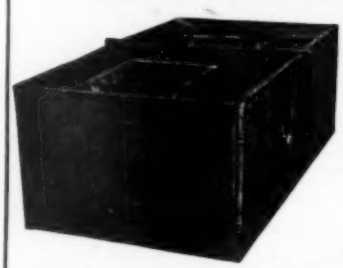
Unless this demand is taken care of by private industry, we will find that many political sub-divisions will be engaged in the manufacture of prestressed structural units for their own needs. There have already been several cases where this has been done; so what are we waiting for?

TEXAS DRY CONCRETE CO., Fort Worth, Texas, is now distributing Sakrete, dry batched concrete, in the states of Texas, Louisiana, Oklahoma and Arkansas.

CARPENTER SEPTIC TANK FORMS

and handling equipment are preferred by large precast tank manufacturers because they use

MINIMUM TIME and LABOR in



Pouring
Stripping
Handling
Resetting forms
Pouring again

LASTLY, and not leastly — ONE MAN makes the delivery with a CARPENTER DELIVERY RIG.

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Richmond 23, Virginia

Concrete Machinery Since 1904

- ☐ Block Machines
- ☐ Brick Machines
- ☐ Concrete Mixers
- ☐ Roof Tile Machines
- ☐ Drain Tile Machines
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- ☐ Stucco Spraying Outfits
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Check square for literature wanted

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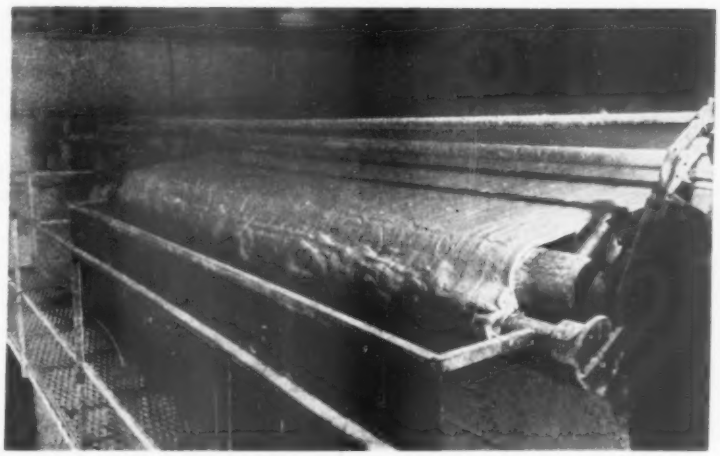
LIME PUTTY IS MADE

FASTER...BETTER...CHEAPER...

At The COLONIAL BLUE DIAMOND MORTAR CORPORATION PLANT, ASTORIA, LONG ISLAND, NEW YORK.



View of discharge of processed lime putty into receiving hopper. Note thickness of lime mat (1½").

MILLER-KOMLINE PROCESS

The Colonial Blue Diamond Mortar Corporation is using the completely revolutionary, patented M-K process to produce a highly superior slaked lime putty for plaster's white coat finish, a material that meets top level specifications.

No water or lime is lost — an important feature in this project, as New York water is expensive and sometimes restricted.

TO CONCRETE PRODUCERS:

The M-K method eliminates aging vats, cuts production time to minutes, and yields a uniform putty ready for use when it leaves the machine.

The operation is simple, and works just the same in making lime putty for brick mortar or stucco, and with the use of the ready-mix concrete truck, you are immediately in business to tap this highly profitable **READY-MIXED BRICK MORTAR** business.

Plasterers say that M-K putty has better plasticity, greater spread, and better covering capacity.

Plants designed by M-K can now be built and put into operation anywhere in the world.

WRITE FOR FULL DETAILS

Exclusive patent licenses are now being issued to qualified parties.

MILLER - KOMLINE CORPORATION

Sole Licensees of M-K Process

DURANDO MILLER — **PEAPACK, NEW JERSEY** — **THOMAS R. KOMLINE**

UNIT TV*

UNIT 1020
¾ Yard Shovel

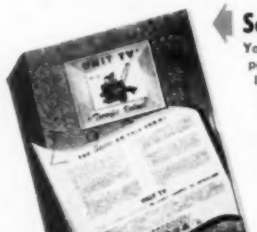
*Terrific Value...
IN EVERY CHANNEL OF OPERATION!

This dependable high-speed excavator "steals the show". You will find it is capable of delivering more work hours at less cost than any similar machine on the market. The UNIT 1020 is carefully engineered for the really tough jobs, with drop forged alloy steel gears and shafts completely enclosed and oil sealed in Unit's exclusive, one-piece gear case. Fewer parts mean less replacements, cut operating and maintenance costs to a minimum. And the modern FULL VISION CAB offers 360° visibility. Keeps both man and machine at top efficiency. Available in gas or Diesel type. Convertible to all attachments. Write for Catalog L-400.

Select
Your Favorite UNIT Star

- ★ UNIT 357 Mobile Type ½ Yard Excavator Crane up to 9 tons.
- ★ UNIT 614 Crawler Type ½ Yard Excavator Crane up to 8 tons.
- ★ UNIT 1020 Crawler Type ¾ Yard Excavator Crane up to 10 tons.
- ★ UNIT 1520 Mobile Type ¾ Yard Excavator Crane up to 20 tons.
- ★ UNIT 1014 Truck Crane ½ Yard Excavator Crane up to 12 tons.
- ★ UNIT 152OT Truck Crane ¾ Yard Excavator Crane up to 20 tons.

All Models Convertible to ALL Attachments.



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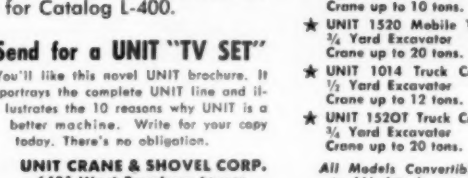
You'll like this novel UNIT brochure. It portrays the complete UNIT line and illustrates the 10 reasons why UNIT is a better machine. Write for your copy today. There's no obligation.

UNIT CRANE & SHOVEL CORP.
6431 West Burnham Street
Milwaukee 14, Wisconsin, U.S.A.



SHOVELS • DRAGLINES • CLAMSHELLS • CRANES • TRENCHOES • MAGNETS

Producers Report

(Continued from page 239)

how many of them will return to us next spring.

"At the moment it appears we will have enough equipment for our needs next year, except of course the normal replacement of wornout equipment."

Minnesota: "Our volume of business was off approximately 15 percent from 1950. The two principal reasons for this decrease in volume are government regulations and inclement weather throughout the year.

"Not only was the volume of business down but the percent of profit was considerably less due to a smaller volume and the increase in price of all items connected with ready-mixed concrete. We were not able to increase the ready-mixed concrete price but all items which we purchased that go into the cost of producing concrete increased in price. It was necessary for us to absorb higher prices in trucks, equipment, cement, sand, gravel, tires, gasoline and labor.

"Our 1951 business year would have been considerably less than it was if the farm market for ready-mixed concrete had not increased in volume over previous years."

Georgia: "Business in 1951 was approximately 15 percent to 20 percent less, both in volume and profits, as compared to 1950.

"No significant change in markets is anticipated. Prices and volume shouldn't change in our area during 1952.

"We anticipate some trouble in securing labor at prices prevailing in our industry locally. We have plans for expanding concrete block production."

Mississippi: "Our 1951 business was approximately 20 percent above 1950. We expect volume to be down in 1952 because of government regulations in the building industry. We have recently acquired a portable ready-mixed concrete plant. We expect to secure jobs anywhere in our state with this concrete plant and we hope thereby to offset the expected decline in volume in our immediate locality."

. . . block makers everywhere are talking about

OSWALT SERVICE for Vibrapac Owners

The good news is getting around fast that OSWALT SERVICE *adds* $60.00 extra profits per day, and insures plant efficiency.

That's right! . . . OSWALT SERVICE boosts output of a vibrapac machine from 600 to 900 blocks per hour, without sacrifice of quality.

Experienced OSWALT service men are always on call to maintain top-level operating efficiency and output.

Many Satisfied Customers now operating 67 Machines

Write for name of OSWALT-Serviced Plant nearest you

OSWALT ENGINEERING SERVICE CORP.

1335 Circle Ave., Forest Park, Ill. **Phones: EStebrook 8-3666 — FOrest 6-3898**

containing full details. Write for OSWALT Booklet

Lime Putty

(Continued from page 241)

a receiving hopper. The springs separate and are subjected to a high pressure water spray to wash off any material adhering, which material is pumped to a storage tank for re-use in subsequent batches. To complete the cycle, the springs return to their position on the drum before again entering the vat to pick up a fresh mat of putty. Water extracted from the lime by the vacuum is returned into the aforementioned storage tank and is re-used in the process.

Lime putty dropped into the receiving hopper is ready for immediate delivery. It is loaded into 27-cu. ft. steel boxes, two at a time, which are handled by fork-lift trucks and put directly on the beds of specially-built boom trucks.

Thus far, there being a great demand for plasterers white coat finish, production has been almost entirely of that product. The same method would apply in manufacturing brick mortar putty except that production would be greater through speeding up the drum filter. A wetter putty, of lower solids content, would thus be produced which would be conveyed to trucks or the mixing plant either by pump or belt conveyor.

The Brooks-Taylor plant is also in production and had been enlarged from four to six 5000-cu. ft. aging tanks. There are now two mixing plants at Astoria, using four mixers, with a mortar capacity of 1500 cu. yd. per day.

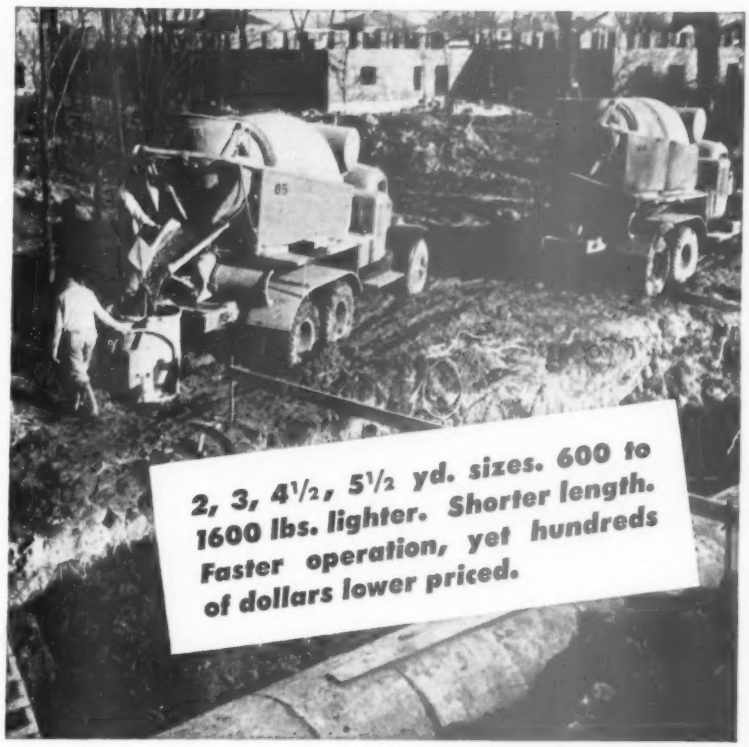
All the equipment in the new plant is of slow-moving characteristics with the exception of the vacuum pump and, as a result, favorable performance with respect to maintenance is to be anticipated. Two men can operate the plant. Cost of operation has been low and, according to Mr. Miller, there has been about a 20 percent reduction in labor and mechanical operating costs when compared with the older process. Installation costs, as well, are lower and far less ground space is required.

Durando Miller has been in the ready-mixed brick mortar business since 1925 and has produced mortar either by a central-mixing plant or in ready-mixed concrete trucks. Many ready-mixed concrete producers having surplus truck mixers can readily diversify their business and guarantee more continued use of their equipment through the production of ready-mixed brick mortar, either sanded lime or completely cement lime mortar. The white coat finishing lime business is one not commonly recognized as having high volume potential.

Plants for the M-K process lime putty range in size from 600 cu. ft. to 2000 cu. ft. in 8 hr. The process has been patented and exclusive licenses for desired localities are available through Miller-Komline Corp.

Jaeger truck mixers are lighter for a bigger payload

yet completely equipped



Because they're *engineered* for weight-saving, Jaeger HI-DUMPS have design features not found in models merely "stripped" for lightness. These are features essential for the production of superior quality concrete (and more concrete is sold by Jaeger Truck Mixers than by any other method). They also make it possible for Jaeger HI-DUMPS to haul more payloads per day.

For example, the diameter-to-length ratio of Jaeger's mixing drum has resulted in an improved drum shape of larger diameter. This new-type drum provides the fastest, most thorough mixing action for *any* slump concrete.

Engineered for time saving—10 seconds per yard to end-load dry materials thru new hopper. Charge wet material in one quick drop through quick-opening "toggle-lock" top door. Fast drum speed, plus low angle discharge cone and continuous blades, discharges 4″ slump concrete @ 20-25 seconds per yard, 1″ slump in 60 seconds.

See your Jaeger distributor or send for Bulletin TM-1.

THE JAEGER MACHINE COMPANY

603 Dublin Ave., Columbus 16, Ohio

AIR COMPRESSORS • PUMPS • MIXERS • HOISTS • TOWERS
AGGREGATE SPREADERS • BITUMINOUS PAVERS • CONCRETE SPREADERS, FINISHERS

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the WORKHORSE of LIFT TRUCKS

"Gives Your Business a Lift"

Every Truck "Custom-Built" . . . for the Customer's Needs

Erickson Model F-5
(Capacity 5000 lbs.) shown with detachable scoop. Fits any Erickson fork model.

Erickson "Custom-Built" F-5
with additional lift. Dual heavy duty tires for soft yards. Capacity 5000 lbs.

Erickson Model F-6
with standard wheels, forks and lift. Capacity 6000 lbs.

We'll be looking for you at the

N.C.M.A. CONVENTION

New York, February 18-20, 1952

4 Speeds Forward
Speeds Reverse
available on all models (Standard on F10 & F16.) Sideshifter optional on all fork models.

Erickson Model F-16

Capacity 16,000 lbs. Shown with boom attachment and utility forks for your pipe work. Supplied with any style forks. Other pipe handling models with 6000, 8000 and 10,000 lbs. capacity.

Erickson Platforms
Model P-5, 5000 lbs.
Model P-6, 6000 lbs.
Model P-7, 7000 lbs.
Handle all racks.

Erickson

POWER LIFT TRUCKS, Inc.

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MINNEAPOLIS 13, MINN.

CONSERCO TRANSIT MIXER TRUCKS FOR RENT

In the months to come, you will have the opportunity to figure on many construction projects that will be too large for you to handle with your own trucks.

Such projects are made accessible to those who employ the **CONSERCO** System . . . a service which has been successfully rendered for the past thirteen years.

CONSERCO offers monthly leases on modern High Discharge Transit Mixers mounted on Heavy Duty Trucks. The lessee has complete control of the equipment throughout the contract period.

In these days of high prices and increasing taxes it will pay you to consider our **RENTAL PLAN.**

Write for information

CONSERCO CO.

ESTABLISHED 1939

RIVER ROAD & B&O RR

WASHINGTON 16, D. C.

ROCK PRODUCTS
DIRECTORY OF MANUFACTURERS' EQUIPMENT
1952

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Advertisers in this issue of ROCK PRODUCTS are identified by a dot (•) preceding the listing. Turn to Advertiser Index for the page number.

Numbers under manufacturers' listings identify subdivision in which their equipment falls. See beginning of each classification for code identification.

A

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1—

•**THE FROG, SWITCH & MFG. CO.,** Carlisle, Pa.
3

GEORGIA IRON WORKS CO., 605 12th St., Augusta, Ga.
1

HAYNES STELLITE CO., DIV. UNION CARBIDE & CARBON CORP., South Lindsay, Kokomo, Ind.
1—2

INTERNATIONAL NICKEL CO., 67 Wall St., New York 5, N. Y.
1

JONES & LAUGHLIN STEEL CORP., Third Ave. & Ross St., Pittsburgh 30, Pa.
1

KENSINGTON STEEL CO., 505 Kensington St., Chicago 28, Ill.
3

LUKENS STEEL CO., 521 Lukens Bldg., Coatesville, Pa.
1—2—3

MANGANESE STEEL FORGE CO., Richmond St. & Castor Ave., Philadelphia 34, Pa.
1—3

•**PETTIBONE MULLIKEN CORP.,** 4710 W. Division St., Chicago 51, Ill.
3

•**RESISTO-LOY CO.,** 127 Baylis St., S.W., Grand Rapids 7, Mich.
1—2—3

•**JOSEPH T. RYERSON & SON, INC.,** 2558 West 16th St., Chicago 80, Ill.
1—2—3

STOODY COMPANY, 11929 E. Slauson Ave., Whittier, Calif.
1—2—3

STROH PROCESS STEEL CO., 1428 High St., Pittsburgh 12, Pa.
1

•**STULZ-SICKLES CO.,** 134 Lafayette St., Newark 5, N. J.
3

•**TAYLOR-WHARTON IRON & STEEL CO.,** High Bridge, N. J.
1—3

•**THOMAS FOUNDRIES, INC.,** P.O. Box 111, Birmingham 1, Ala.
1—2

WALL COLMONOY CORP., 19345 John R. St., Detroit 3, Mich.
1—2

ALTERNATORS, Electric

•**ALLIS-CHALMERS MFG. CO.,** 975 So. 70th St., Milwaukee 1, Wisc.

CROCKER-WHEELER ELECTRIC MFG. CO., DIV. OF ELLIOTT CO., Ampere, N. J.

ELECTRIC MACHINERY MFG. CO., 1331 Tyler St. N.E., Minneapolis 14, Minn.

•**GENERAL ELECTRIC CO.,** 1 River Road, Schenectady 5, N. Y.

INTERNATIONAL DIESEL ELECTRIC CO., INC., 13-02 44th Ave., Long Island City 1, N. Y.

AMMETERS, Electric

THE BRISTOL CO., Waterbury 20, Conn.

•**GENERAL ELECTRIC CO.,** 1 River Road, Schenectady 5, N. Y.

WESTINGHOUSE ELECTRIC CO., First Nat'l Bank Bldg., Pittsburgh, Pa.

WHEELCO INSTRUMENTS CO., 847 W. Harrison St., Chicago 7, Ill.

ANTI-FRICTION BEARINGS (see Bearings)

APRON FEEDERS (see Feeders, Apron)

ARC WELDING APPARATUS (see Welding Machines, Arc)

ASPHALT MIXING PLANTS

•**BARBER-GREENE CO.,** 631 W. Park Ave., Aurora, Ill.

•**BLAW-KNOX DIV. OF BLAW-KNOX CO.,** P.O. Box 1198, Pittsburgh 30, Pa.

HETHERINGTON & BERNER INC., 701-745 Kentucky Ave., Indianapolis 7, Ind.

•**IOWA MFG. CO.,** 916-16th St., N.E., Cedar Rapids, Iowa

THE JAEGER MACHINE CO., 550 W. Spring St., Columbus 16, Ohio

•**KWIX-MIX CO.,** 235 W. Grand Ave., Port Washington, Wis.

NATIONAL AMALGA-PAVE, INC., 357 S. Robertson Blvd., Beverly Hills, Calif.

•**PETTIBONE MULLIKEN CORP.,** 4710 W. Division St., Chicago 51, Ill.

•**PIONEER ENG. WORKS, INC.,** 1515 Central Ave., Minneapolis 13, Minn.

SIMPLICITY SYSTEM CO., Riverside Dr., Chattanooga 6, Tenn.

AUTOCLAVES, Laboratory

•**BLAW-KNOX DIV., BLAW-KNOX CO.,** P.O. Box 1198, Pittsburgh 30, Pa.

THE PATTERSON FOUNDRY & MACHINE CO., 1250 St. George St., East Liverpool, Ohio

PRECISION SCIENTIFIC CO., 3737 W. Cortland St., Chicago 47, Ill.

AXLES & WHEELS, Car & Locomotive

THE BALDWIN LOCOMOTIVE WORKS, Philadelphia 42, Pa.

• A dot before name indicates advertiser in this issue. See advertiser index.

DIRECTORY

BETHLEHEM STEEL CO., 701 E. Third St., Bethlehem, Pa.

THE C. S. CARD IRON WORKS CO., P.O. Box 117, Denver 1, Colo.

THE CHASE FOUNDRY & MFG. CO., 2300 S. Parsons Ave., Columbus 7, Ohio

●**EATON MANUFACTURING CI.**, 739 E. 140 St., Cleveland 10, Ohio

GREENVILLE MFG. WORKS, 112½ W. 4th St., Greenville, Ohio

PRESSED STEEL CAR CO., INC., 25 Broad St., New York 4, N. Y.

H. K. PORTER CO., INC., 49th & Harrison Sts., Pittsburgh 1, Pa.

STROH PROCESS STEEL CO., 1428 High St., Pittsburgh 12, Pa.

TRUCK EQUIPMENT CO. INC., 1791 Fillmore Ave., Buffalo 14, N. Y.

UNITED STATES STEEL CO., 525 Wm. Penn Pl., Pittsburgh 30, Pa.

●**VULCAN IRON WORKS**, 730 So. Main St., Wilkes-Barre, Pa.

B

BABBITT METAL (see Bearing Metals)

BAG CLEANERS

THE DAY COMPANY, 810 Third Ave., N. E., Minneapolis 13, Minn.

MULTIPLEX MACHINERY Corp., Elmore, Ohio

BAGGING MACHINES

ALLIED WELDING & MFG. CO., INC., 49 Lorna Doone Blvd., Orlando, Fla.

BEMIS BROS. BAG. CO., 408 Pine St., St. Louis 2, Mo.

INTERNATIONAL PAPER CO., Machinery Sales & Service Dept., 220 E. 42nd St., New York 17, N. Y.

ST. REGIS SALES CORP., 1036 N. Godfrey St., Allentown, Pa.

RICHARDSON SCALE CO., Van Houten Ave., Clifton, N. J.

BAGS, Dust Collector

AMERICAN WHEELABRATOR & EQUIP. CORP., 439 S. Byrkit St., Mishawaka, Ind.

THE NORTHERN BLOWER CO., 6408 Barberton Ave., Cleveland 2, Ohio

●**UNION BAG AND PAPER CORP.**, 233 Broadway, New York 7, N. Y.

WESTERN PRECIPITATION CORP., 1016 W. Ninth St., Los Angeles 15, Calif.

BAGS

1. **Paper**
2. **Cloth**

BAGPAK DIV., INTERNATIONAL PAPER CO., 220 E. 42nd St., New York 64, N. Y.
1

●**BEMIS BRO. BAG CO.**, 408 Pine St., St. Louis 2, Mo.
1—2

BODINSON MFG. CO., 2401 Bayshore Blvd., San Francisco 24, Calif.

CHASE BAG CO., 309 W. Jackson Blvd., Chicago 6, Ill.
1—2

EQUITABLE PAPER BAG CO., 47-00 31st Place, Long Island City, N. Y.
1

FULTON BAG & COTTON MILLS, P. O. Box 1726, Atlanta 1, Ga.
1—2

●**HAMMOND BAG & PAPER CO.**, Lobmiller Blvd., Wellsburg, W.Va.
1

HUDSON PULP & PAPER CORP., 505 Park Ave., New York 22, N. Y.
1

JAITE COMPANY, Jaite, Ohio
1

●**KRAFT BAG CORP.**, 630 Fifth Ave., New York 20, N. Y., and Daily News Bldg., Chicago 6, Ill.
1

THE RAYMOND BAG CO., Tytus Ave. & Enoch Dr., Middletown, Ohio
1

ST. REGIS SALES CORP., 1036 N. Godfrey St., Allentown, Pa.
1

SECURITY BAG CO., 96 Clifton Pl., Brooklyn 5, N. Y.
1—2

●**UNION BAG AND PAPER CORP.**, 233 Broadway (Woolworth Bldg.) New York 7, N. Y.
1

UNIVERSAL PAPER BAG CO., New Hope, Pa.

WESTERN PRECIPITATION CORP., 1016 W. Ninth St., Los Angeles 15, Calif.

BAG TIES, Wire

●**BEMIS BRO. BAG CO.**, 408 Pine St., St. Louis 2, Mo.

CHASE BAG CO., 309 W. Jackson Blvd., Chicago 6, Ill.

MONTGOMERY & CO., INC., 53 Park Pl., New York 7, N. Y.

SECURITY BAG CO., 96 Clifton Pl., Brooklyn 5, N. Y.

BALL BEARINGS, (see Bearings, Ball)

BALL MILLS (see Mills, Ball)

BALLS & SLUGS, Grinding, (see Grinding Media)

BARGES, Sand and Gravel, etc.

AMERICAN STEEL DREDGE CO., INC., 2511 Taylor St., Fort Wayne 6, Ind.

DRAVO CORPORATION, Neville Island, Pittsburgh 25, Pa.

●**EAGLE IRON WORKS**, 137 Holcomb Ave., Des Moines 4, Iowa

GEORGIA IRON WORKS CO., 605 12th St., Augusta, Ga.

INGALLS SHIPBUILDING CORP., P.O. Drawer 2632, Birmingham 2, Ala.

MANITOWOC ENGINEERING WORKS, Manitowoc, Wisc.

DUMPCRETE DIV., MAXON CONSTRUCTION CO., INC., 131 N. Ludlow St., Dayton 2, Ohio

MILLVILLE IRON WORKS, INC., 6th St. & Florence Ave., Millville, N. J.

●**YUBA MFG. CO.**, 351 California St., San Francisco 4, Calif.

BATCHERS, BIN

1. **Weighing**
2. **Volumetric**

ANCHOR CONCRETE MACHINERY CO., 1191 Fairview Ave., Columbus 12, Ohio
1—2

ANDERSON ENGINEERING CO., 237 Bent St., Cambridge 41, Mass.

ATLAS CAR & MFG. CO., 1140 Ivanhoe Rd., Cleveland 10, Ohio
1

AUTOMATIC LIQUID METER CO., 1372-1378 E. 15th St., Los Angeles 21, Calif.
2

THE C. O. BARTLETT AND SNOW CO., 6200 Harvard Ave., Cleveland 5, Ohio
1

●**BESSER MFG. CO.**, 205 47th St., Alpena, Mich.
1

●**BLAW-KNOX DIV., BLAW-KNOX CO.**, P.O. Box 1198, Pittsburgh 30, Pa.
1—2

BONDED SCALE & MACHINE CO., 41 Bellview Ave., Columbus 7, Ohio
1

BUILDERS - PROVIDENCE, INC., 345 Harris Ave., Providence 1, R. I.
1—2

L. BURMEISTER CO., 4539 W. Mitchell St., Milwaukee 14, Wis.
1—2

●**BUTLER BIN CO.**, Box 407, Waukesha, Wisc.
1—2

CONCRETE TRANSPORT MIXER CO., 4985 Fyler Ave., St. Louis 9, Mo.
1—2

CONSTRUCTION MACHINERY CO'S., Glenwood & Vinton Sts., Waterloo, Iowa
1—2

THE CONVEYOR CO., 3260 East Slauson Ave., Los Angeles 11, Calif.
1—2

●**ROY DARDEN INDUSTRIES, INC.**, P. O. Box 95, North Side Branch, Atlanta 3, Ga.
2

ERIE STEEL CONST. CO., Giest Road & N. P. R. R., Erie, Pa.
1—2

FAIRBANKS MORSE & CO., 600 S. Michigan Ave., Chicago 5, Ill.
1—2

●**FLEMING MFG. CO.**, 4985 Fyler Ave., St. Louis 9, Mo.
1—2

GAR-BRO MFG. CO., 2415 E. Washington Blvd., Los Angeles 21, Calif.
1

HARDY SCALES CO., 5701 So. Atlantic Blvd., Maywood, Calif.
1

THE HELTZEL STEEL FORM AND IRON CO., 1750 Thomas Road, Warren, Ohio
1

THE HOWE SCALE CO., Rutland, Vt.
1—2

IOWA MFG. CO., 916-16th St., N.E., Cedar Rapids, Iowa
1—2

THE JEFFREY MFG. CO., 935 N. 4th St., Columbus 16, Ohio
1—2

●**THE C. S. JOHNSON CO.**, P. O. Box 71, Champaign, Ill.
1—2

●**LIPPMANN ENGINEERING WORKS**, 4603 W. Mitchell St., Milwaukee 14, Wisc.
1—2

THE MARIETTA CONCRETE CORP., P.O. Box 356, Marietta, Ohio
2

MEYER SCALES, INC., 449 Central Ave., Orange, N. J.
1

MIXERMOBILE MANUFACTURERS, 8027 N. E. Killingsworth, P.O. Box 7527, Portland 20, Ore.
2

●**MULTIPLEX MACHINERY CORP.**, Elmore, Ohio

NICHOLS ENG. & RESEARCH CORP., 70 Pine St., New York 5, N. Y.
1

NOBLE CO., 1860 Seventh St., Oakland 20, Calif.
1

RICHARDSON SCALE CO., Van Houton Ave., Clifton, N. J.
1

SCHAFFER POIDOMETER CO., 2828 Smallman St., Pittsburgh 22, Pa.
1

SCIENTIFIC CONCRETE SERVICE CORP., 724 Salem Ave., Elizabeth 3, N. J.
1

SINTERING MACHINERY CORP., Netcong, N. J.
1—2

STEPHENS-ADAMSON MFG. CO., 7 Ridgeway Ave., Aurora, Ill.
1

●**SUPREMIX, INC.**, 401 Grace St., Adrian, Mich.

SYNTRON CO., 450 Lexington Ave., Homer City, Pa.
1—2

TOLEDO SCALE CO., 1090 Telegraph Road, Toledo 12, Ohio
1—2

CHARLES R. WATTS & CO., 4121 Sixth Ave. N.W., Seattle 7, Wash.
2

THE WEBB CORP., 402 E. Broadway, Webb City, Mo.
1

●**WILLARD CONCRETE MACHINERY CO., LTD.**, 2906 Imperial Highway, Lynwood, Calif.
1

THE YALE & TOWNE MFG. CO., Philadelphia 15, Pa.
1—2

BATCHING PLANTS

ANDERSON ENGINEERING CO., 237 Bent St., Cambridge 41, Mass.

●**BLAW-KNOX DIV. OF BLAW-KNOX CO.**, P.O. Box 1198, Pittsburgh 30, Pa.

BODINSON MFG. CO., 2401 Bayshore Blvd., San Francisco 24, Calif.

BONDED SCALE CO., 41 Bellview Ave., Columbus 7, Ohio

●**BUTLER BIN CO.**, Box 407, Waukesha, Wisc.

CONCRETE TRANSPORT MIXER CO., 4985 Fyler Ave., St. Louis, Mo.

CONSTRUCTION MACHINERY COS., Glenwood & Vinton Sts., Waterloo, Iowa

THE CONVEYOR CO., 3260 East Slauson Ave., Los Angeles 11, Calif.

DODSON MFG. CO., INC., 1463 Barwise, Wichita 2, Kansas

ERIE STEEL CONST. CO., Giest Road & N. P. R. R., Erie, Pa.

●**FLEMING MFG. CO.**, 4985 Fyler Ave., St. Louis 9, Mo.

GAR-BRO MFG. CO., 2415 E. Washington Blvd., Los Angeles 21, Calif.

GREENVILLE MFG. WORKS, 112½ W. Fourth St., Greenville, Ohio

HARDY SCALES CO., 5701 So. Atlantic Blvd., Maywood, Calif.

THE HELTZEL STEEL FORM AND IRON CO., 1750 Thomas Road, Warren, Ohio

●**LIPPMANN ENGINEERING WORKS**, 4603 W. Mitchell St., Milwaukee 14, Wisc.

MIXERMOBILE MANUFACTURERS, 8027 N. E. Killingsworth, P.O. Box 7527, Portland 20, Ore.

●**MULTIPLEX MACHINERY CORP.**, Elmore, Ohio

NOBLE CO., 1860 Seventh St., Oakland 20, Calif.

●**THE C. S. JOHNSON CO.**, P.O. Box 71, Champaign, Ill.

WM. E. ROBINSON & CO., 3633 Spring Garden St., Philadelphia 4, Pa.

● A dot before name indicates advertiser in this issue. See advertiser index.

DIRECTORY

STEPHENS-ADAMSON MFG. CO., 7 Ridgeway Ave., Aurora, Ill.

•**SUPREMIX INC.,** 401 Grace St., Adrian, Mich.

•**WILLARD CONCRETE MACHINERY SALES CO.,** 2906 Imperial, Lynwood, Calif.

BATTERIES, Storage

B. F. M. INDUSTRIES, INC., 2124 Mill Ave., Brooklyn 34, N. Y.

THE ELECTRIC STORAGE BATTERY CO., 19th St. & Allegheny Ave., Philadelphia 32, Pa.

THE MARIETTA CONCRETE CORP., Westview, Box 356, Marietta, Ohio

BATTERY CHARGING EQUIPMENT

ALBERT & J. M. ANDERSON MFG. CO., 289-305 A St., Boston 10, Mass.

B. F. M. INDUSTRIES, INC., 2124 Mill Ave., Brooklyn 34, N. Y.

THE ELECTRIC STORAGE BATTERY CO., 19th St. & Allegheny Ave., Philadelphia 32, Pa.

•**GENERAL ELECTRIC CO.,** 1 River Road, Schenectady 5, N. Y.

GENERAL SCIENTIFIC EQUIPMENT CO., 27th and Huntington Sts., Philadelphia 32, Pa.

HOBART BROTHERS CO., Hobart Square, Troy, Ohio

WESTINGHOUSE ELECTRIC CO., First Nat'l Bank Bldg., Pittsburgh, Pa.

BEARING METALS

AMERICAN BRAKE SHOE CO., 230 Park Ave., New York 17, N. Y.

THE BALDWIN LOCOMOTIVE WORKS, Philadelphia 42, Pa.

CARBOLOY DEPT., GENERAL ELECTRIC CO., 11177 E. Eight Mile Rd., Detroit 32, Mich.

MAGNOLIA METAL CO., 18 W. Jersey St., Elizabeth 4, N. J.

•**JOSEPH T. RYERSON & SON, INC.,** 2558 West 16th St., Chicago 80, Ill.

UNITED AMERICAN METALS CORP., 200 Diamond St., Brooklyn 22, N. Y.

BEARINGS

1. **Ball**
2. **Roller**
3. **Thrust**

ANCHOR CONCRETE MACHINERY CO., 1191 Fairview Ave., Columbus 12, Ohio
1

AMERICAN BRAKE SHOE CO., 230 Park Ave., New York 17, N. Y.
3

THE CONVEYOR CO., 3260 East Slauson Ave., Los Angeles 11, Calif.
1—2—3

DODGE MANUFACTURING CORP., Mishawaka, Ind.
1—2

THE FAFNIR BEARING CO., 37 Booth St., New Britain, Conn.
1—3

THE FEDERAL BEARINGS CO. INC., Poughkeepsie, N. Y.
1—3

THE JEFFREY MFG. CO., 935 N. 4th St., Columbus 16, Ohio
3

•**LINK BELT CO.,** 300 W. Pershing Road, Chicago 9, Ill.
1—2—3

NEW DEPARTURE, DIV. GENERAL MOTORS CORP., Bristol, Conn.
1

NICE BALL BEARING CO., 30th & Hunting Park Ave., Philadelphia 40, Pa.
1—3

NORMA - HOFFMAN BEARINGS CO., Hamilton Ave., Stamford, Conn.
1

ROLLER BEARING CO. OF AMERICA, P.O. Box 480, Trenton 3, N. J.
2

ROLLWAY BEARING CO., INC., 541 Seymour St., Syracuse 4, N. Y.
2—3

SHAFER BEARING CORP., 801 Burlington Ave., Downers Grove, Ill.

S K F INDUSTRIES, INC., Front St. & Erie Ave., Philadelphia, Pa.
1—2—3

STEPHENS-ADAMSON MFG. CO., 7 Ridgeway Ave., Aurora, Ill.
1

•**THE TIMKEN ROLLER BEARING CO.,** 1835 Dueber Ave., S. W., Canton 6, Ohio.
2—3

TORRINGTON BEARING CO., Torrington, Conn.
1

BELT ALIGNERS

THE C. O. BARTLETT AND SNOW CO., 6200 Harvard Ave., Cleveland 5, Ohio

•**CHAIN BELT CO.,** 1600 W. Bruce St., Milwaukee 4, Wis.

•**CONTINENTAL GIN CO.,** 4500 5th Ave. S., Birmingham, Ala.

THE CONVEYOR CO., 3260 East Slauson Ave., Los Angeles 11, Calif.

•**DIAMOND IRON WORKS, INC.,** 1728 2nd St., N., Minneapolis 11, Minn.

•**THE J. B. EHRSAM & SONS MFG. CO.,** Enterprise, Kans.

THE JEFFREY MFG. CO., 935 N. 4th St., Columbus 16, Ohio

•**LINK-BELT CO.,** 300 W. Pershing Road, Chicago 9, Ill.

E. F. MARSH ENG. CO., 4324 W. Clayton Ave., St. Louis 10, Mo.

ROBINS CONVEYORS DIV., HEWITT-ROBINS INC., 270 Passaic Ave., Passaic, N. J.

STEPHENS-ADAMSON MFG. CO., 7 Ridgway Ave., Aurora, Ill.

TROWBRIDGE CONVEYOR CO., 851 Van Houten Ave., Clifton, N. J.

BELT CONVEYORS AND ACCESSORIES, (see Conveyors, Belt)

BELT CUTTERS

ARMSTRONG-BRAY & CO., 5364 Northwest Highway, Chicago 30, Ill.

CLIPPER BELT LACER CO., 974 Front Ave. N. W., Grand Rapids 2, Mich.

•**FLEXIBLE STEEL LACING CO.,** 4607 Lexington St., Chicago 44, Ill.

BELT FASTENERS AND LACING

ARMSTRONG-BRAY & CO., 5364 Northwest Highway, Chicago 30, Ill.

THE C. O. BARTLETT AND SNOW CO., 6200 Harvard Ave., Cleveland 5, Ohio

THE BRISTOL CO., Waterbury 20, Conn.

CARLYLE RUBBER CO., INC., 62-66 Park Pl., New York 7, N. Y.

CLIPPER BELT LACER CO., 974 Front Ave., N. W., Grand Rapids 2, Mich.

CRESCENT BELT FASTENER CO., 480 Lexington Ave., New York 17, N. Y.

R & J DICK CO., P.O. Box 388, Passaic, N. J.

•**FLEXIBLE STEEL LACING CO.,** 4607 Lexington St., Chicago 44, Ill.

GREENE, TWEED & CO., North Wales, Pa.

PHILADELPHIA BELTING CO., 6th and Spring Garden Sts., Philadelphia 23, Pa.

J. E. RHOADS & SONS, 35 North 6th St., Philadelphia 6, Pa.

W. O. & M. W. TALCOTT, INC., 91 Sabin St., Providence 1, R. I.

BELT PULLEYS, (see Pulleys, Conveyor, Etc.)

BELT TRIPPERS, (see Conveyor Belt Trippers)

BELTING, Chain

THE C. O. BARTLETT AND SNOW CO., 6200 Harvard Ave., Cleveland 5, Ohio

THE CONVEYOR CO., 3260 East Slauson Ave., Los Angeles 11, Calif.

•**CHAIN BELT CO.,** 1600 W. Bruce St., Milwaukee 4, Wis.

•**LINK-BELT CO.** 300 W. Pershing Road, Chicago 9, Ill.

MORSE CHAIN CO., 7601 Central Ave., Detroit 8, Mich.

TAYLOR-WHARTON IRON & STEEL CO., High Bridge, N. J.

BELTING, Heat Resistant

CARLYLE RUBBER CO. INC., 62-66 Park Pl., New York 7, N. Y.

C. R. DANIELS, INC., 4900 Wetheredsville, Baltimore 16, Md.

L. H. GILMER CO., DIV. U. S. RUBBER CO., Tacony, Philadelphia 35, Pa.

•**THE GOODYEAR TIRE & RUBBER CO., INC.,** 1144 E. Market St., Akron 16, Ohio

•**HEWITT RUBBER DIV., HEWITT-ROBINS INC.,** 240 Kensington Ave., Buffalo 5, N. Y.

•**HEWITT RUBBER DIV., HEWITT-ROBINS INC.,** 240 Kensington Ave., Buffalo 5, N. Y.
1—2—3

MANHEIM MFG. & BELTING CO., 675 Manbel St., Manheim, Pa.

PHILADELPHIA BELTING CO., 6th and Spring Garden Sts., Philadelphia 23, Pa.

J. R. RHOADS & SONS, 35 N. 6th St., Philadelphia 6, Pa.

SCANDINAVIA BELTING CO., 250 Central Ave., Newark 1, N. J.

VICTOR BALATA & TEXTILE BELTING CO., 53 Park Place, New York 7, N. Y.

BELTING, Rubber

1. **Conveyor**
2. **Bucket Elevator**
3. **Power Transmission**

•**BARBER-GREENE CO.,** 631 W. Park Ave., Aurora, Ill.
1

•**BAUGHMAN MFG. CO., INC.,** 1000 Shipman Rd., Jerseyville, Ill.
1—2

•**BOSTON WOVEN HOSE & RUBBER CO.,** P. O. Box 1071, Boston 3, Mass.
1—2—3

CARLYLE RUBBER CO., INC., 62-66 Park Pl., New York 7, N. Y.
1—2—3

THE CINCINNATI RUBBER MFG. CO., Franklin Ave., Cincinnati 12, Ohio
1—2—3

CONCRETE TRANSPORT MIXER CO., 4985 Fyler Ave., St. Louis 9, Mo.
1—2

THE CONVEYOR CO., 3260 East Slauson Ave., Los Angeles 11, Calif.
1—2—3

C. R. DANIELS, INC., 4900 Wetheredsville Rd., Baltimore 16, Md.
1—2—3

R. & J. DICK CO. INC., P. O. Box 388, Passaic, N. J.
1—2—3

THE GATES RUBBER CO., 999 S. Broadway, Denver 17, Colo.
3

L. H. GILMER CO., DIV. OF UNITED STATES RUBBER CO., Tacony, Philadelphia 35, Pa.
3

GOODALL RUBBER CO., Whitehead Road, Trenton 4, N. J.
1—2—3

•**B. F. GOODRICH CO.,** Akron 11, Ohio
1—2—3

•**THE GOODYEAR TIRE & RUBBER CO., INC.,** 1144 E. Market St., Akron 16, Ohio
1—2—3

GEORGE HAISS MFG. CO., Park Ave., & 143rd St., New York 51, N. Y.
1—2—3

HAMILTON RUBBER MFG. CORP., Mead St., Trenton 3, N. J.
1—2—3

HEWITT RUBBER DIV., HEWITT-ROBINS INC., 240 Kensington Ave., Buffalo 5, N. Y.
1—2—3

FRANK A. KREMSER & SONS, INC., 3435-45 N. 5th St., Philadelphia 40, Pa.
1

•**LINK-BELT CO.,** 300 W. Pershing Road, Chicago 9, Ill.
1—2—3

PHILADELPHIA BELTING CO., 6th and Spring Garden Sts. Philadelphia 23, Pa.
1—3

QUAKER RUBBER CORP., Tacony & Comly Sts., Philadelphia 24, Pa.
1—2—3

RAYBESTOS - MANHATTAN, INC., 61 Willett St., Passaic, N. J.
1—2—3

•**REPUBLIC RUBBER DIV., LEE RUBBER & TIRE CORP.,** Albert St., Youngstown 1, Ohio
1—2—3

•**W. A. RIDDELL CORP.,** Bucyrus, Ohio
1—2—3

SCANDINAVIA BELTING CO., 250 Central Ave., Newark 1, N. J.
3

THERMOID COMPANY, Trenton, N. J.
1—2—3

TRIANGLE ENGINEERING CO., 2848 W. 26th St., Chicago 23, Ill.
1—2

TROWBRIDGE CONVEYOR CO., 851 Van Houten Ave., Clifton, N. J.
1—2

UNITED STATES RUBBER CO., 1230 Ave. of the Americas, New York 20, N. Y.
1—2—3

WITTEMANN MACHINERY CO., Paynters Road, Farmingdale, N. J.
1—2—3

WORTHINGTON PUMP & MACHINERY CORP., Worthington Ave., Harrison, N. J.
3

• A dot before name indicates advertiser in this issue. See advertiser index.

DIRECTORY

BELTING, V-Type

•**ALLIS - CHALMERS MFG. CO.,** 975 So. 70th St., Milwaukee 1, Wisc.

THE AMERICAN PULLEY CO., 4200 Wissahickon Ave., Philadelphia 29, Penna.

ANCHOR CONCRETE MACHINERY CO., 1191 Fairview Ave., Columbus 12, Ohio

•**BOSTON WOVEN HOSE & RUBBER CO.,** P. O. Box 1071, Boston 3, Mass.

CARLYLE RUBBER CO., INC., 62-66 Park Pl., New York 7, N. Y.

THE CONVEYOR CO., 3260 East Slauson Ave., Los Angeles 11, Calif.

THE DAYTON RUBBER CO., Dayton 1, Ohio

R. & J. DICK CO., INC., P. O. Box 388, Passaic, N. J.

DODGE MANUFACTURING CORP., Mishawaka, Ind.

•**THE FIRESTONE TIRE & RUBBER CO.,** 1200 Firestone Pkway, Akron 17, Ohio

THE GATES RUBBER CO., 999 S. Broadway, Denver 17, Colo.

L. H. GILMER CO., DIV. OF UNITED STATES RUBBER CO., Tacony, Philadelphia 35, Pa.

•**B. F. GOODRICH CO.,** Akron 11, Ohio

•**THE GOODYEAR TIRE & RUBBER CO., INC.,** 1144 E. Market St., Akron 16, Ohio

GREENVILLE MFG. WORKS, 112½ W. 4th St., Greenville, Ohio

W. A. JONES FOUNDRY & MACHINE CO., 4401 Roosevelt Road, Chicago 24, Ill.

•**LINK-BELT CO.,** 300 W. Pershing Road, Chicago 9, Ill.

LOVEJOY FLEXIBLE COUPLING CO., 5009 W. Lake St., Chicago 44, Ill.

MANHEIM MFG. & BELTING CO., 675 Manbel St., Manheim, Pa.

THE MEDART CO., 100 Potomac St. St. Louis 18, Mo.

PYOTT FOUNDRY & MACHINE CO., 328 N. Sangamon St., Chicago 7, Ill.

QUAKER RUBBER CORP., Tacony & Comly Sts., Philadelphia 24, Pa.

RAYBESTOS - MANHATTAN, INC., 61 Willett St., Passaic, N. J.

•**J. E. RHOADS & SONS,** 35 North 6th St., Philadelphia 6, Pa.

•**THERMOID CO.,** Trenton, N. J.

UNITED STATES RUBBER CO., 1230 Ave. of the Americas, New York 20, N. Y.

WORTHINGTON PUMP & MACHINERY CORP., Worthington Ave., Harrison, N. J.

BELTING, Wire

THE CAMBRIDGE WIRE CLOTH CO., Good Will Road, Cambridge, Md.

THE CONVEYOR CO., 3260 East Slauson Ave., Los Angeles 11, Calif.

KORB-PETTIT WIRE FABRICS & IRON WORKS, INC., 1505-15 N. Mascher St., Philadelphia 22, Pa.

MANGANESE STEEL FORGE CO., Richmond St. & Castor Ave., Philadelphia 34, Pa.

BENDING ROLLS, Reinforcing Steel

THE BALDWIN LOCOMOTIVE WORKS, Philadelphia 42, Pa.

BEAUMONT-BIRCH CO., 1505 Race St., Philadelphia, Pa.

GEO. E. CHRISTOPHER & SON IRON WORKS, 1220 Blaine, Wichita 1, Kans.

CONSTRUCTION MACHY. CO., P.O. Box 358, Waterloo, Iowa

•**QUINN WIRE & IRON WORKS,** Boone, Iowa

BIN AERATORS, Pneumatic

•**THE BIN-DICATOR CO.,** 13946 Kercheoal Ave., Detroit 15, Mich.

BIN GATES

ANCHOR CONCRETE MACHINERY CO., 1191 Fairview Ave., Columbus 12, Ohio

ANDERSON ENGINEERING CO., 237 Bent St., Cambridge 41, Mass.

THE C. O. BARTLETT AND SNOW CO., 6200 Harvard Ave., Cleveland 5, Ohio

•**BAUGHMAN MFG. CO., INC.,** 1000 Shipman Rd., Jerseyville, Ill.

BEAUMONT-BIRCH CO., 1505 Race St., Philadelphia, Pa.

•**BLAW-KNOX DIV. OF BLAW-KNOX CO.,** P.O. Box 1198, Pittsburgh 30, Pa.

BODINSON MFG. CO., 2401 Bayshore Blvd., San Francisco 24, Calif.

•**BUTLER BIN CO.,** Box 407, Waukesha, Wisc.

•**CHAIN BELT CO.,** 1600 N. Bruce St., Milwaukee 4, Wisc.

•**CONTINENTAL GIN CO.,** 4500 5th Ave. S., Birmingham, Ala.

THE CONVEYOR CO., 3260 East Slauson Ave., Los Angeles 11, Calif.

GEO. E. CHRISTOPHER & SON IRON WORKS, 1220 Blaine, Wichita 1, Kans.

CONCRETE TRANSPORT MIXER CO., 4985 Fyler Ave., St. Louis 9, Mo.

•**DIAMOND IRON WORKS, INC.,** 1728 2nd St., No., Minneapolis 11, Minn.

ERIE STEEL CONST. CO., Giest Road & N. P. R. R., Erie, Pa.

•**FULLER COMPANY,** Fuller Bldg., Catasauqua, Pa.

•**FLEMING MFG. CO.,** 4985 Fyler Ave., St. Louis 9, Mo.

GAR-BRO MFG. CO., 2415 E. Washington Blvd., Los Angeles 21, Calif.

GREENVILLE MFG. WORKS, 112½ W. 4th. Greenville, Ohio

GRUENDLER CRUSHER & PULVERIZER CO., 2915-17th N. Market St., St. Louis, Mo.

HARDY SCALES CO., 5701 So. Atlantic Blvd., Maywood, Calif.

•**ROBINS CONVEYORS DIV., HEWITT-ROBINS INC.,** 270 Passaic Ave., Passaic, N. J.

•**IOWA MFG. CO.,** 916 16th St., N. E., Cedar Rapids, Iowa

THE JEFFREY MFG. CO., 935 N. 4th St., Columbus 16, Ohio

•**THE C. S. JOHNSON CO.,** P. O. Box 71, Champaign Ill.

•**KENNEDY VAN SAUN MFG. & ENG. CORP.,** 2 Park Ave., New York 16, N. Y.

•**LINK-BELT CO.,** 300 W. Pershing Road, Chicago 9, Ill.

MANGANESE STEEL FORGE CO., Richmond St. & Castor Ave., Philadelphia 34, Pa.

E. F. MARSH ENG. CO., 4324 W. Clayton Ave., St. Louis 10, Mo.

MORSE BROS. MACHINERY CO., 2900 Brighton Blvd., Denver 1, Colo.

•**McLANAHAN AND STONE CORP.,** Hollidaysburg, Pa.

THE NEFF & FRY CO., 150 S. Main St., Camden, Ohio

NOBLE CO., 1860 Seventh St., Oakland 20, Calif.

•**PIONEER ENG. WORKS, INC.,** 1515 Central Ave., Minneapolis 13, Minn.

RICHARDSON SCALE CO., Van Houton Ave., Clifton, N. J.

ROGERS IRON WORKS CO., 11th & Pearl Sts., Joplin, Mo.

•**SMITH ENGINEERING WORKS,** 532 E. Capitol Dr., Milwaukee 12, Wisc.

THE STANDARD METAL MFG. CO., Malinta, Ohio

STEPHENS-ADAMSON MFG. CO., 7 Ridgeway Ave., Aurora, Ill.

STRAUB MFG. CO., 456 Chestnut St., Oakland 7, Calif.

•**SUPREMIX, INC.,** 401 Grace St., Adrian, Mich.

UNITED IRON WORKS CO., 108 No. Locust, Pittsburg, Kans.

•**UNIVERSAL ENGINEERING CORP.,** 625 C Ave., N. W., Cedar Rapids, Iowa

UNIVERSAL ROAD MACHINERY CO., 27 Emerick St., Kingston, N. Y.

WISCONSIN FOUNDRY & MACHINE CO., 623 E. Main St., Madison, Wis.

WITTEMANN MACHINERY CO., Paynters Road, Farmingdale, N. J.

BIN LEVEL INDICATORS

•**THE BIN-DICATOR CO.,** 13946 Kercheval Ave., Detroit 15, Mich.

•**BLAW-KNOX CO.,** P.O. Box 1198, Pittsburgh 30, Pa.

•**BUTLER BIN CO.,** Box 407, Waukesha, Wis.

CONCRETE TRANSPORT MIXER CO., 4985 Fyler Ave., St. Louis 9, Mo.

THE CONVEYOR CO. INC., 3260 E. Slauson Ave., Los Angeles 11, Calif.

ERIE STEEL CONST. CO., Geist Rd. and N.P.R.R., Erie, Pa.

•**FLEMING MFG. CO.,** 4985 Fyler Ave., St. Louis 9, Mo.

•**FULLER COMPANY,** Fuller Bldg., Catasauqua, Pa.

THE HELTZEL STEEL FORM & IRON CO., 1750 Thomas Rd., Warren, Ohio

THE JEFFREY MFG. CO., 935 N. 4th St., Columbus 16, Ohio

•**THE C. S. JOHNSON CO.,** P. O. Box 71, Champaign, Ill.

MOSHER ELECTRONIC CONTROLS, 25 Boston Post Rd., Larchmont, N. Y.

NOBLE CO., 1860 Seventh St., Oakland 20, Calif.

•**SYNTRON CO.,** 405 Lexington Ave., Homer City, Pa.

BINS AND BATCHING EQUIPMENT

ANDERSON ENGINEERING CO., 237 Bent St., Cambridge 41, Mass.

BEAUMONT BIRCH CO., 1512 Race St., Philadelphia 2, Pa.

•**BESSER MFG. CO.,** 205 47th St., Alpena, Mich.

•**BLAW-KNOX DIV. OF BLAW-KNOX CO.,** P.O. Box 1198, Pittsburgh 30, Pa.

BODINSON MFG. CO., 2401 Bayshore Blvd., San Francisco 24, Calif.

BONDED SCALE CO., 41 Bellview, Columbus 7, Ohio

•**BUTLER BIN CO.,** Box 407, Waukesha, Wisc.

CONCRETE TRANSPORT MIXER CO., 4985 Fyler Ave., St. Louis 9, Mo.

CONSTRUCTION MACHINERY CO., Glenwood & Vinton Sts., Waterloo, Iowa

THE CONVEYOR CO., 3260 East Slauson Ave., Los Angeles 11, Calif.

DODSON MFG. CO. INC., 1463 Barwise, Wichita, Kans.

ERIE STEEL CONST. CO., Giest Road & N. P. R. R., Erie, Pa.

•**FLEMING MFG. CO.,** 4985 Fyler Ave., St. Louis, Mo.

GAR-BRO MFG. CO., 2415 E. Washington Blvd., Los Angeles 21, Calif.

GREENVILLE MFG. WORKS, 112½ W. Fourth St., Greenville, Ohio

HARDY SCALES CO., 5701 So. Atlantic Blvd., Maywood, Calif.

THE HELTZEL STEEL FORM AND IRON CO., 1750 Thomas Road, Warren, Ohio

•**IOWA MFG. CO.,** 916 16th St., N. E., Cedar Rapids, Iowa

IRVINGTON FORM & TANK CORP., 20 Vesey St., New York 7, N. Y.

THE JEFFREY MFG. CO., 935 N. 4th St., Columbus 16, Ohio

•**THE C. S. JOHNSON CO.,** P. O. Box 71, Champaign, Ill.

LANDIS STEEL CO., 116 W. A St., Picher, Okla.

•**LINK-BELT CO.,** 300 W. Pershing Road, Chicago 9, Ill.

•**LIPPMANN ENGINEERING WORKS,** 4603 W. Mitchell St., Milwaukee 14, Wisc.

THE MARIETTA CONCRETE CORP., Box 356, Marietta, Ohio

MEYER SCALES, INC., 449 Central Ave., Orange, N. J.

•**MULTIPLEX MACHINERY CORP.,** Elmore, Ohio

THE NEFF & FRY CO., 150 S. Main St., Camden, Ohio

NOBLE CO., 1860 Seventh St., Oakland 20, Calif.

RICHARDSON SCALE CO., Van Houton Ave., Clifton, N. J.

ROBINS CONVEYOR DIV., HEWITT-ROBINS INC., 270 Passaic Ave., Passaic, N. Y.

WM. E. ROBINSON & CO., 3307 Spring Garden St., Philadelphia 4, Pa.

ROGERS IRON WORKS CO., 11th & Pearl Sts., Joplin, Mo.

SINTERING MACHINERY CORP., Netcong, N. J.

STEPHENS-ADAMSON MFG. CO., 7 Ridgeway Ave., Aurora, Ill.

•**SuPREMIX, INC.,** 401 Grace St., Adrian, Mich.

WISCONSIN FOUNDRY & MACHINE CO., 623 E. Main St., Madison, Wis.

WITTEMANN MACHINERY CO., Paynters Road, Farmingdale, N. J.

BINS, STORAGE: CONCRETE (MONOLITHIC)

GREENVILLE MFG. WORKS, Greenville, Ohio

THE HELTZEL STEEL FORM AND IRON CO., 1750 Thomas Road, Warren, Ohio

IRVINGTON FORM & TANK CORP., 20 Vesey St., New York 7, N. Y.

METAL FORMS CORP., 3334 N. Booth St., Milwaukee 12, Wis.

THE NEFF & FRY CO., 150 S. Main St., Camden, Ohio

WITTEMANN MACHINERY CO., Paynters Rd., Farmingdale, N. J.

BIN, STORAGE: CONCRETE (PRECAST)

CONCRETE SILO CO., P. O. Box 346, Bloomfield, Ind.

THE MARIETTA CONCRETE CORP., Box 356, Marietta, Ohio

THE NEFF & FRY CO., 150 S. Main St., Camden, Ohio

WITTEMANN MACHINERY CO., Paynters Rd., Farmingdale, N. J.

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DIRECTORY

BINS, STORAGE: STEEL

ACME ROAD MACHINERY CO., East Main St., Frankfort, N. Y.

ALLIED WELDING & MFG. CO. INC., 49 Lorna Doone Blvd., Orlando, Fla.

ALPHA TANK & SHEET METAL MFG. CO., 5001 S. 38th St., St. Louis 16, Mo.

ANDERSON ENGINEERING CO., 237 Bent St., Cambridge 41, Mass.

ARNOLD & WEIGEL DIV., TOLEDO ENGINEERING CO., INC., 958 Wall St., Toledo 6, Ohio

•**AUSTIN-WESTERN CO.,** 601 N. Farnsworth Ave., Aurora, Ill.

•**BAUGHMAN MFG. CO., INC.,** 1000 Shipman Rd., Jerseyville, Ill.

•**BESSER MFG. CO.,** 205 47th St., Alpena, Mich.

BETHLEHEM STEEL CO., 701 E. Third St., Bethlehem, Pa.

BIRMINGHAM TANK CO., DIV. OF INGALLS IRON WKS. CO., P. O. Drawer 1490, Birmingham 1, Ala.

•**BLAW-KNOX DIV. OF BLAW-KNOX CO.,** P.O. Box 1198, Pittsburgh 30, Pa.

BODINSON MFG. CO., 2401 Bayshore Blvd., San Francisco 24, Calif.

L. BURMEISTER CO., 4535 W. Mitchell St., Milwaukee 14, Wis.

•**BUTLER BIN CO.,** Box 407, Waukesha, Wisc.

CONCRETE TRANSPORT MIXER CO., 4985 Fyler Ave., St. Louis 9, Mo.

CONSTRUCTION MACHINERY COS., Glenwood & Vinton Sts., Waterloo, Iowa

THE CONVEYOR CO., 3260 East Slauson Ave., Los Angeles 11, Calif.

THE DAY COMPANY, 810 Third Ave., N. E., Minneapolis 13, Minn.

•**DIAMOND IRON WORKS, INC.,** 1728 2nd St., No., Minneapolis 11, Minn.

•**FLEMING MFG. CO.,** 4985 Fyler Ave., St. Louis 9, Mo.

GENERAL AMERICAN TRANSPORTATION CORP., Field Bldg., Room 3105, 135 So. LaSalle St., Chicago 90, Ill.

GAR-BRO MANUFACTURING CO., 2415 E. Washington, Los Angeles 21, Cal.

GENERAL ENGINES CO., 307 Hunter St., Gloucester, N. J.

GREENVILLE MFG. WORKS, 112½ W. Fourth St., Greenville, Ohio

HARDY SCALES CO., 5701 So. Atlantic Blvd., Maywood, Calif.

THE HELTZEL STEEL FORM AND IRON CO., 1750 Thomas Road, Warren, Ohio

•**ROBINS CONVEYORS DIV., HEWITT-ROBINS INC.,** 270 Passaic Ave., Passaic, N. J.

IRVINGTON FORM & TANK CORP., 20 Vesey St., New York 7, N. Y.

•**THE C. S. JOHNSON CO.,** P. O. Box 71, Champaign, Ill.

THE KIRK & BLUM MFG. CO., 3120 Forrer, Cincinnati 9, Ohio

LANDIS STEEL CO., 416 W. A St., Picher, Okla.

McDERMOTT BROS. CO., Ft. of Washington St., Allentown, Pa.

•**MULTIPLEX MACHINERY CORP.,** Elmore, Ohio

NOBLE CO., 1860 Seventh St., Oakland 20, Calif.

PETTIBONE-MULLIKEN CORP., IMPACT MASTER DIV., 4700 W. Division St., Chicago 51, Ill.

•**PIONEER ENG. WORKS, INC.,** 1515 Central Ave., Minneapolis 13, Minn.

REPUBLIC STEEL CORP., Republic Bldg., Cleveland 1, Ohio

RICHARDSON SCALE CO., Van Houton Ave., Clifton, N. J.

ROGERS IRON WORKS CO., 11th & Pearl Sts., Joplin, Mo.

•**SMITH ENGINEERING WORKS,** 532 E. Capitol Dr., Milwaukee 12, Wis.

STEPHENS-ADAMSON MFG. CO., 7 Ridgeway Ave., Aurora, Ill.

•**SuPREMIX, INC.,** 401 Grace St., Adrian, Mich.

UNITED IRON WORKS CO., 108 No. Locust, Pittsburg, Kans.

•**UNIVERSAL ENGINEERING CORP.,** 625 C Ave., N. W., Cedar Rapids, Iowa

UNIVERSAL ROAD MACHINERY CO., 27 Emerick St., Kingston, N. Y.

•**WILLIAMS PATENT CRUSHER & PULVERIZER CO.,** 800 St. Louis Ave., St. Louis 6, Mo.

BITS, Carbide Drill

ACKER DRILL CO., INC., 721 W. Lackawanna Ave., Scranton 3, Pa.

CARBOLOY DEPT., GENERAL ELECTRIC CO., 11177 E. Eight Mile Rd., Detroit 32, Mich.

GARDNER-DENVER CO., Quincy, Ill.

•**GENERAL ELECTRIC CO.,** 1 River Rd., Schenectady 5, N. Y.

INGERSOLL-RAND CO., 11 Broadway, New York 4, N. Y.

ROCK BIT SALES & SERVICE CO., 2514 E. Cumberland St., Philadelphia 25, Pa.

SALEM TOOL CO., 700 S. Ellsworth St., Salem, Ohio

SANDVIK STEEL, INC., 111 Eighth Ave., New York 11, N. Y.

•**THE TIMKEN ROLLER BEARING CO.,** 1835 Dueber Ave., S. W., Canton 6, Ohio

WORTHINGTON PUMP & MACHINERY CORP., Worthington Ave., Harrison, N. J.

BITS, Drill

ACKER DRILL CO., INC., 721 W. Lackawanna Ave., Scranton 3, Pa.

•**BUCYRUS-ERIE CO.,** South Milwaukee, Wis.

CARBOLOY DEPT., GENERAL ELECTRIC CO., 11177 E. Eight Mile Rd., Detroit 32, Mich.

•**CHICAGO PNEUMATIC TOOL CO.,** 6 E. 44th St., New York 17, N. Y.

INGERSOLL-RAND CO., 11 Broadway, New York 4, N. Y.

•**JOY MANUFACTURING CO.,** Henry W. Oliver Bldg., Pittsburgh 22, Pa.

THE LOOMIS MACHINE CO., 15 E. Market St., Tiffin, Ohio

ROCK BIT SALES & SERVICE CO., 2514 E. Cumberland St., Philadelphia 25, Pa.

SALEM TOOL CO., 700 S. Ellsworth St., Salem, Ohio

THE SANDERSON CYCLONE DRILL CO., 157 S. Main St., Orrville, Ohio

SCHRAMM INC., West Chester, Pa.

SPRAGUE & HENWOOD, INC., 221 W. Olive St., Scranton 2, Pa.

STAR DRILLING MACHINE CO., 474 Washington St., Akron 11, Ohio

•**THE TIMKEN ROLLER BEARING CO.,** 1835 Deuber Ave., S. W., Canton 6, Ohio

WORTHINGTON PUMP & MACHINERY CORP., Worthington Ave., Harrison, N. J.

BITS, Drill, Detachable

ACKER DRILL CO., INC., 721 W. Lackawanna Ave., Scranton 3, Pa.

GARDNER-DENVER CO., Quincy Ill.

INGERSOLL-RAND CO., 11 Broadway, New York 4, N. Y.

•**JOY MANUFACTURING CO.,** Henry W. Oliver Bldg., Pittsburgh 22, Pa.

ROCK BIT SALES & SERVICE CO., 2514 E. Cumberland St., Philadelphia 25, Pa.

SALEM TOOL CO., 700 S. Ellsworth St., Salem, Ohio

SCHRAMM INC., West Chester, Pa.

•**THE TIMKEN ROLLER BEARING CO.,** 1835 Deuber Ave., S. W., Canton 6, Ohio.

WORTHINGTON PUMP & MACHINERY CORP., Worthington Ave., Harrison, N. J.

BITS, Drill, Grinders

CARBOLOY DEPT., GENERAL ELECTRIC CO., 11177 E. Eight Mile Rd., Detroit 32, Mich.

INGERSOLL-RAND CO., 11 Broadway, New York 4, N. Y.

•**JOY MANUFACTURING CO.,** Henry W. Oliver Bldg., Pittsburgh, 22, Pa.

THE MINE & SMELTER SUPPLY CO., 1422 17th St., Denver 17, Colo.

MONTGOMERY & CO., INC., 53 Park Pl., New York 7, N. Y.

SANDVIK STEEL, INC., 111 Eighth Ave., New York 11, N. Y.

SCHRAMM INC., West Chester, Pa.

BLACKSMITH TOOLS

THE LOOMIS MACHINE CO., 15 E. Market St., Tiffin, Ohio

BLASTING MACHINES

AMERICAN CYANAMID CO., Explosives Dept., 30 Rockefeller Plaza, New York 20, N. Y.

AMERICAN WHEELABRATOR & EQUIP. CORP., 439 S. Byrkit St., Mishawaka, Ind.

ATLAS POWDER CO., Wilmington 99, Del.

E. I. du PONT de NEMOURS & CO., INC., Wilmington 98, Del.

FARMERS ENG. & MFG. CO., 549 Brushton Ave., Pittsburgh 21, Pa.

•**HERCULES POWDER CO.,** 946 King St., Wilmington, Del.

ILLINOIS POWDER MFG. CO., 730 Pierce Bldg., St. Louis 2, Mo.

THE KING POWDER CO., INC., 1703—1st National Bank Bldg., Cincinnati, Ohio

MILLER MANUFACTURING CO., P.O. Dr. 666, El Paso, Texas

SALEM TOOL CO., 700 S. Ellsworth St., Salem, Ohio

BLASTING SUPPLIES

AMERICAN CYANAMID CO., Explosives Dept., 30 Rockefeller Plaza, New York 20, N. Y.

ATLAS POWDER CO., Delaware Trust Bldg., Wilmington, Del.

E. I. du PONT de NEMOURS & CO., INC., Wilmington 98, Del.

ENSIGN BICKFORD CO., S. Hopmeadow St., Simsbury, Conn.

THE EQUITABLE POWDER MFG. CO., East Alton, Ill.

•**HERCULES POWDER CO.,** 946 King St., Wilmington, Del.

ILLINOIS POWDER MFG. CO., 730 Pierce Bldg., St. Louis 2, Mo.

THE KING POWDER CO., INC., 1733—1st National Bank Bldg., Cincinnati, Ohio

KORB-PETTIT WIRE FABRICS & IRON WORKS, INC., 1505-15 N. Mascher St., Philadelphia 22, Pa.

MILLER MANUFACTURING CO., Mills Bldg., P. O. Dr. 666, El Paso, Tex.

TROJAN POWDER CO., 17 N. Seventh St., Allentown, Pa.

VIBRATION ENGINEERING CO., 131 N. Wyoming St., Hazleton, Pa.

VIBRATION MEASUREMENT ENGRS. CO., 7665 No. Sheridan Road, Chicago, Ill.

BLOCK MACHINES, Concrete Building

1. Tamping
2. Vibrating

ANCHOR CONCRETE MACHINERY CO., 1191 Fairview Ave., Columbus 12, Ohio
1—2

•**BESSER MFG. CO.,** Alpena, Mich.
1—2

CHASE CONCRETE MACHINERY CO., 94 Grandview Ave., Buffalo, 23, N. Y.
2

GEO. C. CHRISTOPHER & SON IRON WORKS CO., 1220 Blaine, Wichita 1, Kans.
1

COLORCRETE INDUSTRIES, INC., 24th & Ottawa Ave., Holland, Mich.
1

•**COLUMBIA MACHINE WORKS,** 107 S. Grand Ave., Vancouver, Wash.

•**CONCRETE EQUIPMENT CO.,** Holland, Mich.

CONCRETE TRANSPORT MIXER CO., 4985 Fyler Ave., St. Louis 9, Mo.
1—2

ROY DARDEN INDUSTRIES, INC., P. O. Box 95, North Side Branch, Atlanta 3, Ga.
2

•**DES PLAINES CONCRETE PROD. MACHINERY CO.,** P.O. Box 152, Des Plaines, Ill.
1—2

W. E. DUNN MFG. CO., 550 W. 23rd St., Holland, Mich.
1

•**FLEMING MFG. CO.,** 4985 Fyler Ave., St. Louis, Mo.
2

GENERAL ENGINES CO., 307 Hunter St., Gloucester, N. J.
2

F. C. GEORGE MACHINE CO., INC., 100 S. Westmoreland Dr., Orlando, Fla.
1—2

HYDRO-FORGED STONE ASSOCIATES, INC., 420 Bulkley Bldg., Cleveland 15, Ohio
2

JACKSON & CHURCH CO., 321 N. Hamilton Ave., Saginaw, Mich.
1—2

•**THE KENT MACHINE CO.,** 113 E. Portage Trail, Cuyahoga Falls, Ohio
1—2

•**LITH-I-BAR CO.,** Sentinal Bldg., Holland, Mich.
1—2

MAGIC CONCRETE EQUIPMENT CO., 18 Woodland Ave., Winsted, Conn.
2

MISHCO CORP., 615 S. W. 2nd Ave., Miami, Fla.
1—2

•**MULTIPLEX MACHINERY CORP.,** Elmore, Ohio
1—2

THE GENE OLSEN CORP., 401 Grace St., Adrian, Mich.
2

•**PRASCHAK MACHINE CO.,** Marshfield, Wisc.
1—2

SPEEDBLOCK, INC., 1144 Union Commerce Bldg., Cleveland 14, Ohio

•**STEARNS MFG. CO., INC.,** 600 E. Beecher St., Adrian, Mich.
1—2

H. R. SUTTER CO., 661 Wyoming Ave., Buffalo, N. Y.
1

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DIRECTORY

TWINPLEX HYDRAULICS, INC., 2507 James St., Syracuse 6, N. Y.
2

R. K. TYRA CORP., Tyra, Minn.

WITTEMANN MACHINERY CO., Paynters Road, Farmingdale, N. J.
1—2

YELLEN HI-SPEED BLOCK MACHINE CO., 381 Jeffries St., Perth Amboy, N. J.

BLOCK MACHINE ACCESSORIES

ANCHOR CONCRETE MACHINERY CO., 1191 Fairview Ave., Columbus 12, Ohio

BERGEN MACHINE & TOOL CO., INC., 189 Franklin St., Nutley 10, N. J.

•**BESSER MFG. CO.,** 205 47th St., Alpena, Mich.

CHASE CONCRETE MACHINERY CO., 94 Grandview Ave., Buffalo 23, N. Y.

•**COLUMBIA MACHINE WORKS,** 107 S. Grand Ave., Vancouver, Wash.

CONCRETE TRANSPORT MIXER CO., 4985 Fyler Ave., St. Louis 9, Mo.

•**FLEMING MFG. CO.,** 4985 Fyler Ave., St. Louis 9, Mo.

GENERAL ENGINES CO., INC., 307 Hunter St., Gloucester, N. J.

F. C. GEORGE MACHINE CO., INC., 100 S. Westmoreland Dr., Orlando, Florida

HYDRO-FORGED STONE ASSOCIATES, INC., 420 Bulkley Bldg., Cleveland 15, Ohio

•**THE KENT MACHINE CO.,** 113 E. Portage Trail, Cuyahoga Falls, Ohio

•**LITH-I-BAR CO.,** Sentinal Bldg., Holland, Mich.

MISHCO CORP., 615 S. W. 2nd Ave., Miami, Fla.

•**MULTIPLEX MACHINERY CORP.,** Elmore, Ohio

THE GENE OLSEN CORP., 401 Grace St., Adrian, Mich.

•**STEARNS MFG. CO., INC.,** 600 E. Beecher St., Adrian, Mich.

TEXAS FOUNDRIES, INC. P.O. Box 180, Lufkin, Texas

R. K. TYRA CORP., Tyra, Minn.

WITTEMANN MACHINERY CO., Paynters Rd., Farmingdale, N. J.

YELLEN HI-SPEED BLOCK MACHINE CO., 381 Jeffries St., Perth Amboy, N. J.

BLOCKS, Pillow, Ball and Roller Bearing

THE C. O. BARTLETT AND SNOW CO., 6200 Harvard Ave., Cleveland 5, Ohio

•**CHAIN BELT CO.,** 1600 W. Bruce St., Milwaukee 4, Wis.

•**CONTINENTAL GIN CO.,** 4500 5th Ave. S., Birmingham, Ala.

THE CONVEYOR CO., 3260 East Slauson Ave., Los Angeles 11, Calif.

•**DIAMOND IRON WORKS, INC.,** 1728 N. 2nd St., Minneapolis 11, Minn.

R. & J. DICK CO., INC., P. O. Box 388, Passaic, N. J.

DODGE MANUFACTURING CORP., Mishawaka, Ind.

•**THE J. B. EHRSAM & SONS MFG. CO.,** Enterprise, Kans.

THE FAFNIR BEARING CO., 37 Booth St., New Britain, Conn.

•**ROBINS CONVEYORS DIV., HEWITT-ROBINS INC.,** 270 Passaic Ave., Passaic, N. J.

W. A. JONES FOUNDRY & MACHINE CO., 4401 Roosevelt Rd., Chicago 24, Ill.

•**LINK-BELT CO.,** 300 W. Pershing Road, Chicago 9, Ill.

THE MEDART CO., 100 Potomac St., St. Louis 18, Mo.

ST. PAUL HYDRAULIC HOIST CO., 2207 University Ave., S. E., Minneapolis, Minn.

SILVER ENGINEERING WORKS, INC., 3309 Blake St., Denver 5, Colo.

SPROUT, WALDRON & CO., INC., Muncy, Pa.

STEPHENS-ADAMSON MFG. CO., 7 Ridgeway Ave., Aurora, Ill.

UNITED IRON WORKS CO., 108 No. Locust, Pittsburg, Kans.

WITTEMANN MACHINERY CO., Paynters Rd., Farmingdale, N. J.

BLOCKS, REFRACTORY, (see Refractories)

BLOCKS, Sheave and Chain

•**AMERICAN HOIST & DERRICK CO.,** 63 S. Robert St., St. Paul 1, Minn.

THE CLEVELAND CHAIN & MFG. CO., 445 Henry St., Cleveland 5, Ohio

DOWNS CRANE & HOIST CO., 540 W. Vernon Ave., Los Angeles 37, Calif.

•**JOY MANUFACTURING CO.,** Henry W. Oliver Bldg., Pittsburgh 22, Pa.

MADESCO TACKLE BLOCK CO., P. O. Box 148, Easton, Pa.

•**SAUERMAN BROS., INC.,** 530 S. Clinton St., Chicago 7, Ill.

THE UPSON-WALTON CO., Perry Payne Bldg., Cleveland 13, Ohio

WISCONSIN FOUNDRY & MACHINE CO., 623 E. Main St., Madison, Wis.

WRIGHT HOIST DIV., AMERICAN CHAIN & CABLE CO., INC., York, Pa.

BLOWERS, (see Fans and Blowers)

BLOW TORCHES, Heaters, Thawing Outfits for Frozen Aggregates

•**DIAMOND IRON WKS.,** 1728 2nd St. No., Minneapolis 11, Minn.

LITTLEFORD BROS., INC., 453 E. Pearl St., Cincinnati 20, Ohio

THE SIGHT FEED GENERATOR CO., P.O. Box 38, West Alexandria, Ohio.

BOATS, Derrick, Tow

INGALLS SHIPBUILDING CORP., P. O. Drawer 2638, Birmingham 2, Ala.

MANITOWOC ENGINEERING WORKS, Manitowoc, Wisc.

BOATS, Self-Unloading

THE C. O. BARTLETT AND SNOW CO., 6200 Harvard Ave., Cleveland 5, Ohio

HEWITT-ROBINS INC., 270 Passaic Ave., Passaic, N. J.

INGALLS SHIPBUILDING CORP., P.O. Drawer 2632, Birmingham 2, Ala.

MANITOWOC ENGINEERING WORKS, Manitowoc, Wisc.

STEPHENS-ADAMSON MFG. CO., 7 Ridgeway Ave., Aurora, Ill.

BODIES, Ready Mixed Concrete

1. **Transit Mixed**
2. **Non-Agitator**

•**BLAW-KNOX DIV. OF BLAW-KNOX CO.,** P.O. Box 1198, Pittsburgh 30, Pa.
1

•**CHAIN BELT CO.,** 1600 W. Bruce St., Milwaukee 4, Wisc.
1

CONCRETE TRANSPORT MIXER CO., 4985 Fyler Ave., St. Louis, Mo.
1

•**CONSERCO CO.,** River Road & B&O R. R., Washington, D. C.
1

•**COOK BROS. EQUIPMENT CO.,** 1815 N. Broadway, Los Angeles 31, Calif.
1—2

DUMPCRETE DIV., MAXON CONSTRUCTION CO., INC., 131 N. Ludlow St., Dayton 2, Ohio
2

HERCULES STEEL PRODUCTS CORP., Sherman St., Galion, O.
2

•**THE JAEGER MACHINE CO.,** 550 W. Spring St., Columbus 16, O.
1

MIXERMOBILE MANUFACTURERS, 6855 N. E. Halsey St., P. O. Box 5108, Portland 16, Ore.
1

•**THE T. L. SMITH CO.,** 2835 N. 32nd St., Milwaukee 45, Wis.
1

•**WILLARD CONCRETE MACHINERY SALES CO.,** 2906 Imperial Highway, Lynwood, Cal.
1

WORTHINGTON PUMP & MACHINERY CORP., Worthington Ave., Harrison, N. J.
1

BODIES, Detachable Concrete Truck

DUMPCRETE DIV., MAXON CONSTRUCTION CO., INC., 131 N. Ludlow St., Dayton 2, Ohio

BROOKS EQUIPMENT & MFG. CO., 408-10 Davenport Road, Knoxville 3, Tenn.

LUKENS STEEL CO., 521 Lukens Bldg., Coatesville, Pa.

McCABE-POWERS AUTO BODY CO., 5900 N. Broadway, St. Louis 15, Mo.

BODIES, Dump, Dump Truck

ANTHONY COMPANY, Streator, Ill.

ATHEY PRODUCTS CO., 5631 W. 65th St., Chicago 38, Ill.

THE BURCH CORP., Crestline, Ohio

•**COOK BROS. EQUIPMENT CO.,** 1815 N. Broadway, Los Angeles 31, Calif.

DEMPSTER BROTHERS, INC., Springdale St., Knoxville 17, Tenn.

EASTON CAR & CONSTRUCTION CO., Easton, Pa.

GALION ALL STEEL BODY CO., Galion, Ohio

GAR WOOD INDUSTRIES, INC., Wayne Div., Wayne, Mich.

FRUEHAUF TRAILER CO., Detroit 32, Mich.

THE HEIL CO., 3000 W. Montana St., Milwaukee 1, Wisc.

HENNEUSE ENGINEERING CO., Marion, Ohio

HERCULES STEEL PRODUCTS CORP., Sherman St., Galion, Ohio

KEWANEE MANUFACTURING CO., Department RP, Kewanee, Ill.

LANDIS STEEL CO., 116 W. A St., Picher, Okla.

LUKENS STEEL CO., 521 Lukens Bldg., Coatesville, Pa.

THE MARION METAL PRODUCTS CO., Cheney Ave. & Otis St., Marion, Ohio

THE PERFECTION STEEL BODY CO., S. East St., Galion, Ohio

PRESSED STEEL CAR CO., INC., 25 Broad St., New York 4, N. Y.

ST. PAUL HYDRAULIC HOIST, 2207 University Ave., S. E., Minneapolis 14, Minn.

TRUCK ENGINEERING CORP., 1285 W. 70th St., Cleveland 2, Ohio

TRUCK EQUIPMENT CO. INC., 1791 Fillmore Ave., Buffalo 14, N. Y.

WISCONSIN FOUNDRY & MACHINE CO., 623 E. Main St., Madison, Wis.

BODIES, Trailer

ANTHONY COMPANY, Streator, Ill.

ATHEY PRODUCTS, 5631 W. 65th St., Chicago 43, Ill.

•**COOK BROS. EQUIPMENT CO.,** 1815 N. Broadway, Los Angeles 31, Calif.

EASTON CAR & CONSTRUCTION CO., Easton, Pa.

FRUEHAUF TRAILER CO., Detroit 32, Mich.

GALION ALL STEEL BODY CO., Galion, Ohio

GAR WOOD INDUSTRIES, INC., Wayne Div., Wayne, Mich.

THE HEIL CO., 3000 W. Montana St., Milwaukee 1, Wis.

HERCULES STEEL PRODUCTS CORP., Sherman St., Galion, O.

LANDIS STEEL CO., 116 W. A St., Picher, Okla.

McCABE-POWERS AUTO BODY CO., 5900 N. Broadway, St. Louis 15, Mo.

THE PERFECTION STEEL BODY CO., S. East St., Galion, Ohio

ST. PAUL HYDRAULIC HOIST, 2207 University Ave., S. E., Minneapolis 14, Minn.

•**SCHONROCK EQUIPMENT MFG. CO.,** P.O. Box 1543, San Angelo, Texas

TRUCK ENGINEERING CO., 1285 W. 70th St., Cleveland 2, Ohio

TRUCK EQUIPMENT CO. INC., 1791 Fillmore Ave., Buffalo 14, N. Y.

BODIES, Trailer, Bulk Cement

•**BAUGHMAN MFG. CO., INC.,** Jerseyville, Ill.

•**BUTLER BIN CO.,** Box 407, Waukesha, Wisc.

THE CONVEYOR CO., 3260 East Slauson Ave., Los Angeles 11, Calif.

•**COOK BROS. EQUIPMENT CO.,** 1815 N. Broadway, Los Angeles 31, Calif.

FRUEHAUF TRAILER CO., Detroit 32, Mich.

HERCULES STEEL PRODUCTS CORP., Sherman St., Galion, O.

LANDIS STEEL CO., 116 W. A St., Picher, Okla.

THE MARION METAL PRODUCTS CO., Cheney Ave. & Otis St., Marion, Ohio

McCABE-POWERS AUTO BODY CO., 5900 N. Broadway, St. Louis 15, Mo.

•**SCHONROCK EQUIPMENT MFG. CO.,** P.O. Box 1543, San Angelo, Texas

THE TRAILMOBILE CO., 31st and Robertson Aves., Cincinnati 19, Ohio

TRUCK ENGINEERING CORP., 1285 W. 70th St., Cleveland 2, Ohio

TRUCK EQUIPMENT CO. INC., 1791 Fillmore Ave., Buffalo 14, N. Y.

BODIES, truck, concrete block self-unloading

•**ARTHUR REHBERGER & SON, INC.,** 320 Ferry St., Newark 5, N. J.

BOILER ACCESSORIES

•**COOK BROS. EQUIPMENT CO.,** 1815 N. Broadway, Los Angeles 31, Cal.

THE HAYS CORP., East 8th St., Michigan City, Ind.

• A dot before name indicates advertiser in this issue. See advertiser index.

DIRECTORY

JOSEPH T. RYERSON & SON, INC., 2558 West 16th St., Chicago 80, Ill.

STAPLES & PFEIFFER, 528 Bryant St., San Francisco 7, Calif.

BOILER FEED WATER SYSTEMS

THE DORR CO., INC., Barry Pl., Stamford, Conn.

BOILER INSULATION

AMERICAN VERMICULITE CORP., 654 Madison Ave., New York 21, N. Y.

ARMSTRONG CORK COMPANY, Liberty Street, Lancaster, Pa.

•**THE BABCOCK & WILCOX CO.,** 85 Liberty St., New York 6, N. Y.

CHICAGO FIRE BRICK CO., 1467 Elston Ave., Chicago 22, Ill.

THE DENVER FIRE CLAY CO., 2301 Blake St., Denver 17, Colo.

A. P. GREEN FIRE BRICK CO., 1018 E. Breckenridge, Mexico, Mo.

MEXICO REFRACTORIES CO., Mex-R-Co. Bldg., Mexico, Mo.

QUIGLEY COMPANY, INC., 527 Fifth Ave., New York 17, N. Y.

THE RUBBEROID CO., 500 Fifth Ave., New York 18, N. Y.

BOILER TUBES

•**THE BABCOCK & WILCOX CO.,** 85 Liberty St., New York 6, N. Y.

WM. BROS. BOILER & MFG. CO., 1057 10th Ave., S.E., Minneapolis 14, Minn.

REPUBLIC STEEL CORP., Republic Bldg., Cleveland 1, Ohio

•**JOSEPH T. RYERSON & SON, INC.,** 2558 West 16th St., Chicago 80, Ill.

BOILERS

•**THE BABCOCK & WILCOX CO.,** 85 Liberty St., New York 6, N. Y.

WM. BROS. BOILER & MFG. CO., 1057 10th Ave. S. E., Minneapolis 14, Minn.

CLEAVER-BROOKS CO., 326 E. Keefe Ave., Milwaukee 12, Wis.

THE DORR CO., 570 Lexington Ave., New York 22, N. Y.

•**KENNEDY VAN SAUN MFG. & ENG. CORP.,** 2 Park Ave., New York 16, N. Y.

•**SHORE ENGINEERING,** 320 Broadway, New York 7, N. Y.

STRUTHERS WELLS CORP., Pennsylvania Ave., Warren, Pa.

WICKES BOILER CO., 519 N. Washington St., Saginaw, Mich.

BOILERS, Waste Heat

•**THE BABCOCK & WILCOX CO.,** 85 Liberty St., New York 6, N. Y.

WM. BROS. BOILER & MFG. CO., 1057 10th Ave. S. E., Minneapolis 14, Minn.

•**KENNEDY VAN SAUN MFG. & ENG. CORP.,** 2 Park Ave., New York 16, N. Y.

STRUTHERS WELLS CORP., Pennsylvania Ave., Warren, Pa.

WICKES BOILER CO., 519 N. Washington St., Saginaw, Mich.

BOOSTERS, Voltage, Motor Generator

•**ALLIS-CHALMERS MFG. CO.,** 975 So. 70th St., Milwaukee 1, Wisc.

•**GENERAL ELECTRIC CO.,** 1 River Road, Schenectady 5, N. Y.

WESTINGHOUSE ELECTRIC CO., First Nat'l Bank Bldg., Pittsburgh, Pa.

BRAKE LINING

AMERICAN BRAKE SHOE CO., 230 Park Ave., New York 17, N. Y.

•**THE FIRESTONE TIRE & RUBBER CO.,** 1200 Firestone Pkway, Akron 17, Ohio

FRUEHAUF TRAILER CO., Detroit 32, Mich.

•**THE GOODYEAR TIRE & RUBBER CO. INC.,** 1144 E. Market St., Akron 16, Ohio

GREENVILLE MFG. WORKS, 112½ W. 4th St., Greenville, Ohio

GREY-ROCK DIV., RAYBESTOS-MANHATTAN, INC., Manheim, Pa.

•**M & M ENGINEERING CORP.,** 3928 Millersville Drive, Indianapolis 5, Ind.

THE RAYBESTOS DIV., RAYBESTOS-MANHATTAN, INC., 75 E. Main, Stratford, Conn.

RAYBESTOS - MANHATTAN, INC., 61 Willett St., Passaic, N. J.

SOUTHERN FRICTION MATERIALS CO., P.O. Box 1475, Charlotte 1, N. C.

•**THERMOID COMPANY,** Trenton, N. J.

WAGNER ELECTRIC CORP., 6400 Plymouth Ave., St. Louis 14, Mo.

THE S. K. WELLMAN CO., 1374 E. 51st St., Cleveland 3, Ohio

BRAKES

1. **Clutch**
2. **Hydraulic**
3. **Magnetic**

THE ELECTRIC CONTROLLER & MFG. CO., 2700 E. 79th St., Cleveland 4, Ohio

•**GENERAL ELECTRIC CO.,** 1 River Road, Schenectady 5, N. Y.
3

•**M & M ENGINEERING CORP.,** 3928 Millersville Dr., Indianapolis 5, Ind.
2

STEARNS MAGNETIC MFG. CO., 675 S. 28th St., Milwaukee 46, Wisc.
3

WAGNER ELECTRIC CORP., 6400 Plymouth Ave., St. Louis 14, Mo.
2

WESTINGHOUSE ELECTRIC CO., First Nat'l Bank Bldg., Pittsburgh, Pa.
3

BRICK, Refractory, Fire, (see Refractories)

BRICK MACHINES AND MOLDS

1. **Concrete**
2. **Sand-Lime**

ANCHOR CONCRETE MACHINERY CO., 1191 Fairview Ave., Columbus 12, Ohio
1—2

•**BESSER MFG. CO.,** Alpena, Mich.
1

CHASE CONCRETE MACHINERY CO., 94 Grandview Ave., Buffalo 23, N. Y.
1

COLORCRETE INDUSTRIES, INC., 510 Ottawa Ave., Holland, Mich.
1

COLUMBIA MACHINE WORKS, 107 S. Grand Ave., Vancouver, Wash.
1

ROY DARDEN INDUSTRIES, INC., P. O. Box 95, North Side Branch, Atlanta 3, Ga.
1—2

W. E. DUNN MFG. CO., 550 W. 23rd St., Holland, Mich.
1

GENERAL ENGINES CO., 307 Hunter St., Gloucester, N. J.
1

JACKSON & CHURCH CO., 321 N. Hamilton St., Saginaw 65, Mich.
1—2

•**KENNEDY VAN SAUN MFG. & ENG. CORP.,** 2 Park Ave., New York 16, N. Y.
2

•**MULTIPLEX MACHINERY CORP.,** Elmore, Ohio
1—2

THE GENE OLSEN CORP., 401 Grace St., Adrian, Mich.
1

•**W. A. RIDDELL CORP.,** Bucyrus, Ohio
1—2

•**STEARNS MFG. CO., INC.,** 600 E. Beecher St., Adrian, Mich.
1

R. K. TYRA CORP., Tyro, Minn.

WITTEMANN MACHINERY CO., Paynters Road, Farmingdale, N. J.
1—2

BUCKET LOADERS

•**BARBER-GREENE CO.,** 631 W. Park Ave., Aurora, Ill.

EAGLE CRUSHER CO., INC., 900 Harding Way E., Galion, Ohio

THE EIMCO CORP., P.O. Box 300, Salt Lake City 10, Utah

GEORGE HAISS MFG. CO., Park Ave. & 143rd St., New York 51, N. Y.

LULL MFG. CO., 3612 E. 44th St., Minneapolis 6, Minn.

MAINE STEEL INC., 169 Frost St., South Portland, Me.

MIXERMOBILE MANUFACTURERS, 8027 N. E. Killingsworth, P.O. Box 7527, Portland 20, Ore.

OTTAWA STEEL PRODUCTS CO., Ottawa, Kansas

OWEN BUCKET CO., 6001 Breakwater Ave., Cleveland 2, Ohio

•**PETTIBONE MULLIKEN CORP.,** 4710 W. Division St., Chicago 51, Ill

SHEPPARD DIESELS, Philadelphia St., Honover, Pa.

TRACKSON COMPANY, 3333 S. Chase Ave., Milwaukee 7, Wis.

TRIANGLE ENGINEERING CO., 2848 W. 26th St., Chicago 23, Ill.

TROWBRIDGE CONVEYOR CO., 851 Van Houten Ave., Clifton, N. J.

BUCKET LIPS & TEETH

ALLIED STEEL PRODUCTS, INC., 7835 Broadway, Cleveland 5, O.

AMERICAN BRAKE SHOE CO., 230 Park Ave., New York 17, N. Y.

•**AMERICAN MANGANESE STEEL DIV. OF AMERICAN BRAKE SHOE CO.,** 401 E. 14th St., Chicago Heights, Ill.

•**BUCYRUS-ERIE CO.,** South Milwaukee, Wisc.

CHICAGO STEEL FOUNDRY CO., 3720 So. Kedzie Ave., Chicago 32, Ill.

FARRELL-CHEEK STEEL CO., Sandusky, Ohio

•**THE FROG, SWITCH & MFG. CO.,** Carlisle, Pa.

GEORGE HAISS MFG. CO., Park Ave. & 143rd St., New York 51, N. Y.

THE H & L TOOTH CO., 1540 S. Greenwood Ave., Montebello, Cal.

LULL MFG. CO., 3612 E. 44th St., Minneapolis 6, Minn.

KENSINGTON STEEL CO., 505 Kensington St., Chicago 28, Ill.

MANGANESE STEEL FORGE CO., Richmond St. & Castor Ave., Philadelphia 34, Pa.

OWEN BUCKET CO., 6001 Breakwater Ave., Cleveland 2, Ohio

•**PARSONS ENGINEERING CO.,** 4407 Maplecrest, Cleveland, Ohio

•**SCHIELD BANTAM CO.,** 216 Park St., Waverly, Iowa

STROH PROCESS STEEL CO., 1428 High St., Pittsburgh 12, Pa.

•**TAYLOR-WHARTON IRON & STEEL CO.,** High Bridge, N. J.

THE WELLMAN ENGINEERING CO., 7000 Central Ave., Cleveland 5, Ohio

YUBA MFG. CO., 351 California St., San Francisco 4, Calif.

YAUN WELDING & DRAGLINE BUCKETS, INC., P.O. Box 1508, Baton Rouge, La.

BUCKETS

1. **Clamshell & Orange Peel**
2. **Dragline & Slackline**
3. **Dredge & Excavator**
4. **Elevator**
5. **Grapple**
6. **Skip**
7. **Tramway**
8. **Tractor Loader**

ACME ROAD MACHINERY CO., East Main Street, Frankfort, N. Y.
4

•**ALLIS-CHALMERS MFG. CO., TRACTOR DIVN.,** P.O. Box 512, Milwaukee 1, Wis.
8

AMERICAN BRAKE SHOE CO., 230 Park Ave., New York 17, N. Y.
2—3—4—5

•**AMERICAN MANGANESE STEEL DIV. OF AMERICAN BRAKE SHOE CO.,** 401 E. 14th St., Chicago Heights, Ill.
1—3—4

AMERICAN STEEL DREDGE CO., INC., 2511 Taylor St., Fort Wayne 6, Ind.
3

ATLAS CAR & MFG CO., 1140 Ivanhoe Rd., Cleveland 10, Ohio
6

THE C. O. BARTLETT AND SNOW CO., 6200 Harvard Ave., Cleveland 5, Ohio
4—6

BEAUMONT BIRCH CO., 1512 Race St., Philadelphia 2, Pa.
2—4—6

•**BLAW-KNOX DIV. OF BLAW-KNOX CO.,** P.O. Box 1198, Pittsburgh 30, Pa.
1—5

BAY CITY SHOVELS, INC., Bay City, Mich.
2

BODINSON MFG. CO., 2401 Bayshore Blvd., San Francisco 24, Calif.
4

•**BUCYRUS-ERIE CO.,** South Milwaukee, Wisc.
1—2—3—5—8

•**CHAIN BELT CO.,** 1600 W. Bruce St., Milwaukee 4, Wisc.
4

CHASE FOUNDRY & MFG. CO., 2300 S. Parsons Ave., Columbus 7, Ohio
6

COLORCRETE INDUSTRIES, INC., 24th & Ottawa Ave., Holland, Mich.

CONCRETE TRANSPORT MIXER CO., 4985 Fyler Ave., St. Louis 9, Mo.
4—6

•**CONTINENTAL GIN CO.,** 4500 5th Ave. S., Birmingham, Ala.
4

DEMPSTER BROTHERS, INC., Springdale St., Knoxville 17, Tenn.
6

•**DIAMOND IRON WORKS, INC.,** 1728 N. 2nd St., Minneapolis 11, Minn.
4

EASTON CAR & CONSTRUCTION CO., Easton, Pa.
6

THE EIMCO CORP., P.O. Box 300, Salt Lake City 10, Utah
8

• A dot before name indicates advertiser in this issue. See advertiser index.

DIRECTORY

ERIE STEEL CONST. CO., Giest Road & N. P. R. R., Erie, Pa.
1—2—3—5

•**FLEMING MFG. CO., INC.**, 4985 Fyler Ave., St. Louis 9, Mo.
4—6

•**THE FROG, SWITCH & MFG. CO.**, Carlisle, Pa.
3

GAR-BRO MFG. CO., 2415 E. Washington Blvd., Los Angeles 21, Calif.
6

GEORGE HAISS MFG. CO., Park Ave. & 143rd St., New York 51, N. Y.
1—2

GREENVILLE MFG. WORKS, 112½ W. 4th St., Greenville, Ohio
2—4—6—7

•**HARNISCHFEGER CORP.**, 4400 W. National Ave., Milwaukee 14, Wis.
2

•**THE HAYWARD CO.**, 202-204 Fulton St., New York, N. Y.
1—2—3—5

•**HENDRICK MFG. CO.**, 47 Dundaff St., Carbondale, Pa.
4

HENDRIX MFG. CO., P. O. Box 31, Mansfield, La.
2

•**ROBINS CONVEYORS DIV., HEWITT-ROBINS INC.**, 270 Passaic Ave., Passaic, N. J.
4

INSLEY MFG. CORP., 801 N. Olney, Indianapolis 1, Ind.
2

THE JEFFREY MFG. CO., 935 N. 4th St., Columbus 16, Ohio
4—6

•**THE C. S. JOHNSON CO.**, P. O. Box 71, Champaign, Ill.
1—4

FRANK A. KREMSER & SONS, INC., 3435-45 N. 5th St., Philadelphia 40, Pa.
4

LANDIS STEEL CO., 116 W. A St., Picher, Okla.
4

•**LINK-BELT CO.**, 300 W. Pershing Road, Chicago 9, Ill.
4—6

LUKENS STEEL CO., 521 Lukens Bldg., Coatesville, Pa.
1—2

LULL MFG. CO., 3612 E. 44th St., Minneapolis 6, Minn.
8

MAINE STEEL INC., 169 Front St., South Portland, Me.
8

MANGANESE STEEL FORGE CO., Richmond St. & Castor Ave., Philadelphia 34, Pa.
4

M. P. McCAFFREY, INC., 2121 East 25th St., Los Angeles 11, Calif.
1—2

McDERMOTT BROS. CO., Ft. of Washington St., Allentown, Pa.
4

NORTHERN CONVEYOR CO., 327 W. State St., Janesville, Wis.
4

THE GENE OLSEN CORP., 401 Grace St., Adrian, Mich.
6

ORTON CRANE & SHOVEL CO., 608 S. Dearborn St., Chicago 5, Ill.
1—5

OWEN BUCKET CO., 6001 Breckwater Ave., Cleveland 2, Ohio
1—3—5

PAGE ENGINEERING CO., Clearing P. O. Chicago 38, Ill.
2

•**PETTIBONE MULLIKEN CORP.**, 4710 W. Division St., Chicago 51, Ill.
1—2

ROGERS IRON WORKS CO., 11th & Pearl Sts., Joplin, Mo.
4

•**SAUERMAN BROS., INC.**, 530 S. Clinton St., Chicago 7, Ill.
2

•**SCHIELD BANTAM CO.**, 216 Park St., Waverly, Iowa
1—2—3—5

SHEPPARD DIESELS, Philadelphia St., Hanover, Pa.
8

•**SMITH ENGINEERING WORKS**, 532 E. Capitol Dr., Milwaukee 12, Wis.
4

THE STANDARD METAL MFG. CO., Malinta, Ohio
4

•**STEARNS MFG. CO., INC.**, 600 E. Beecher St., Adrian, Mich.
6

STEPHENS-ADAMSON MFG. CO., 7 Ridgeway Ave., Aurora, Ill.
4—6

•**TAYLOR-WHARTON IRON & STEEL CO.**, High Bridge, N. J.
3

•**TRACKSON COMPANY**, 3333 S. Chase Ave., Milwaukee 7, Wis.
8

TRACTOMOTIVE CORP., County Line Road, Deerfield, Ill.
8

TRIANGLE ENGINEERING CO., 2848 W. 26th St., Chicago 23, Ill.
2—4

UNITED IRON WORKS CO., 108 N. Locust, Pittsburg, Kans.
4

UNIVERSAL ROAD MACHINERY CO., 27 Emerick St., Kingston, N. Y.
4

WAYNE CRANE DIV., AMERICAN STEEL DREDGE CO., INC., P. O. Box 570, Fort Wayne 1, Ind.
3

THE WELLMAN ENGINEERING CO., 7000 Central Ave., Cleveland 5, Ohio
1—2—3—5

•**WILLIAMS PATENT CRUSHER & PULVERIZER CO.**, 800 St. Louis Ave., St. Louis 6, Mo.
4

WESTERN MACHINERY CO., 760-766 Folsom St., San Francisco 7, Calif.
1—2

WISCONSIN FOUNDRY & MACHINE CO., 623 E. Main St., Madison, Wis.
4

•**YUBA MFG. CO.**, 351 California St., San Francisco 4, Calif.
3

WITTEMANN MACHINERY CO., Paynters Rd., Farmingdale, N. J.
6

YAUN MANUFACTURING CO., INC., 2120 N. Third St., P.O. Box 1508, Baton Rouge, La.

BUILDINGS, Industrial, all Steel

BETHLEHEM STEEL CO., 701 E. Third St., Bethlehem, Pa.

THE H. K. FERGUSON CO., Ferguson Building, Cleveland 14, O.

GREENVILLE MFG. WORKS, 112½ W. 4th St., Greenville, Ohio

THE INGALLS IRON WORKS CO., 620 Avenue D, Birmingham 2, Ala.

REPUBLIC STEEL CORP., Republic Bldg., Cleveland 1, Ohio

SOUTHWESTERN ENGINEERING CO., 4800 Santa Fe Ave., Los Angeles 58, Calif.

TRUSCON STEEL CO., Albert St., Youngstown 1, Ohio

BULK CEMENT HANDLING EQUIPMENT

•**BARBER-GREENE CO.**, 631 W. Park Ave., Aurora, Ill.

THE C. O. BARTLETT AND SNOW CO., 6200 Harvard Ave., Cleveland 5, Ohio

•**BAUGHMAN MFG. CO., INC.**, 1000 Shipman Rd., Jerseyville, Ill.

BEAUMONT-BIRCH CO., 1512 Race St., Philadelphia 2, Penna.

•**BLAW-KNOX DIV. OF BLAW-KNOX CO.**, P.O. Box 1198, Pittsburgh 30, Pa.

BODINSON MFG. CO., 2401 Bayshore Blvd., San Francisco 24, Calif.

BONDED SCALE CO., 2166 S. 3rd St., Columbus, Ohio

•**BUTLER BIN CO.**, Box 407, Waukesha, Wisc.

•**CHAIN BELT CO.**, 1600 W. Bruce St., Milwaukee 4, Wis.

CONCRETE TRANSPORT MIXER CO., 4985 Fyler Ave., St. Louis 9, Mo.

CONSTRUCTION MACHINERY CO., Glenwood and Vinton Sts., Waterloo, Iowa

•**CONTINENTAL GIN CO.**, 4500 5th Ave. S., Birmingham, Ala.

THE CONVEYOR CO., 3260 East Slauson Ave., Los Angeles 11, Calif.

•**THE J. B. EHRSAM & SONS MFG. CO.**, Enterprise, Kan.

ERIE STEEL CONST. CO., Geist Rd. and N.P.R.R., Erie, Penna.

•**FULLER COMPANY**, Fuller Bldg., Catasauqua, Pa.

GAR-BRO MFG CO., 2415 E. Washington Blvd., Los Angeles 21, Calif.

GREENVILLE MFG. WORKS, 112½ W. 4th St., Greenville, Ohio

HARDY SCALES CO., 5701 So. Atlantic Blvd., Maywood, Calif.

•**ROBINS CONVEYOR DIV., HEWITT-ROBINS INC.**, 270 Passaic Ave., Passaic, N. J.

•**THE FRANK G. HOUGH CO.**, Sunnyside Ave., Libertyville, Ill.

•**THE C. S. JOHNSON CO.**, P.O. Box 71, Champaign, Ill.

THE JEFFREY MFG. CO., 935 N. 4th St., Columbus 16, Ohio

•**KENNEDY VAN SAUN MFG. & ENG. CORP.**, 2 Park Ave., New York 16, N. Y.

•**THE KENT MACHINE CO.**, 1931 Thomas St., Cuyahoga Falls, Ohio

•**LINK BELT COMPANY**, 300 W. Pershing Rd., Chicago 9, Ill.

NOBLE CO., 1860 Seventh St., Oakland 20, Calif.

WM. E. ROBINSON & CO., 3633 Spring Garden St., Phila. 4, Pa.

STEPHENS-ADAMSON MFG. CO., 7 Ridgeway Ave., Aurora, Ill.

•**SuPREMIX, INC.**, 401 Grace St., Adrian, Mich.

WISCONSIN FOUNDRY & MACHINE CO., 623 E. Main St., Madison, Wis.

BULK CEMENT STORAGE PLANTS

•**BAUGHMAN MFG. CO., INC.**, 1000 Shipman Rd., Jerseyville, Ill.

•**BLAW-KNOX DIV. OF BLAW-KNOX CO.**, P.O. Box 1198, Pittsburgh 30, Pa.

BONDED SCALE CO., 2166 S. 3rd St., Columbus, Ohio

•**BUTLER BIN CO.**, Box 407, Waukesha, Wisc.

CONCRETE TRANSPORT MIXER CO., 4985 Fyler Ave., St. Louis 9, Mo.

CONSTRUCTION MACHINERY CO'S., Glenwood & Vinton Sts., Waterloo, Iowa

THE CONVEYOR CO., 3260 East Slauson Ave., Los Angeles 11, Calif.

•**THE J. B. EHRSAM & SONS MFG. CO.**, Enterprise, Kans.

ERIE STEEL CONST. CO., Giest Road & N. P. R. R., Erie, Pa.

•**FLEMING MFG. CO.**, 4985 Fyler Ave., St. Louis 9, Mo.

GAR-BRO MFG. CO., 2416 E. 16th St., Los Angeles 21, Calif.

GREENVILLE MFG. WORKS, 112½ W. 4th St., Greenville, Ohio

HARDY SCALES CO., 5701 So. Atlantic Blvd., Maywood, Calif.

•**THE C. S. JOHNSON CO.**, P.O. Box 71, Champaign, Ill.

LANDIS STEEL CO., 116 W. A St., Picher, Okla.

THE NEFF & FRY CO., 150 S. Main St., Camden, Ohio

THE MARIETTA CONCRETE CORP., Box 356, Marietta, Ohio

NOBLE CO., 1860 Seventh St., Oakland 20, Calif.

ROBINSON AIR-ACTIVATED CONVEYOR SYSTEMS, 205 E. 42nd St., New York 17, N. Y.

WM. E. ROBINSON & CO., 3307 Spring Garden St., Philadelphia 4, Pa.

SOUTHWESTERN ENGINEERING CO., 4800 Santa Fe Ave., Los Angeles 58, Calif.

STEPHENS-ADAMSON MFG. CO., 7 Ridgeway Ave., Aurora, Ill.

•**SuPREMIX, INC.**, 401 Grace St., Adrian, Mich.

BULLDOZERS, Land Clearing Equipment

•**ALLIS-CHALMERS MFG. CO.**, 975 So. 70th St., Milwaukee 1, Wisc.

•**ALLIS-CHALMERS MFG. CO., TRACTOR DIVISION**, P. O. Box 512, Milwaukee 1, Wisc.

THE BAKER MFG. CO., 10th and Stanford, Springfield, Ill.

•**BUCYRUS-ERIE CO.**, South Milwaukee, Wisc.

•**CATERPILLAR TRACTOR CO.**, Peoria 8, Ill.

CONSTRUCTION PRODUCTS CORP., 410 San Fernando Road, Los Angeles 31, Calif.

DEMPSTER BROTHERS, INC., Springdale St., Knoxville 17, Tenn.

DROTT MFG. CORP., 3841 W. Wisconsin Ave., Milwaukee 8, Wis.

THE HEIL CO., 3000 W. Montana St., Milwaukee 1, Wisc.

LAPLANT-CHOATE MFG. CO., INC., 2920 1st Ave. N.E., Cedar Rapids, Iowa

HENNEUSE ENGINEERING CO., Marion, Ohio

•**THE FRANK G. HOUGH CO.**, Sunnyside Ave., Libertyville, Ill.

•**R. G. LeTOURNEAU, INC.**, 2301 N. Adams St., Peoria, Ill.

LULL MFG. CO., 3612 E. 44th St., Minneapolis 6, Minn.

M-R-S MANUFACTURING CO., P. O. Box 336, Flora, Miss.

MAINE STEEL INC., 169 Front St., South Portland, Me.

THE OLIVER CORP., INDUSTRIAL DIV., 19300 Euclid Ave., Cleveland 17, Ohio

SHEPPARD DIESELS, Philadelphia St., Hanover, Pa.

STAPLES & PFEIFFER, 528 Bryant St., San Francisco 7, Cal.

•**TRACKSON COMPANY**, 333 S. Chase Ave., Milwaukee 7, Wis.

TRACTOMOTIVE CORP., County Line Road, Deerfield, Ill.

WM. BROS. BOILER & MFG. CO., 1057 10th Ave. S. E., Minneapolis 14, Minn.

WOOLDRIDGE MANUFACTURING CO., Sunnyvale, Calif.

BURNERS, Kiln

•**ALLIS-CHALMERS MFG. CO.**, 975 So. 70th St., Milwaukee 1, Wis.

CHICAGO STEEL FOUNDRY CO., 3720 S. Kedzie Ave., Chicago 32, Ill.

• A dot before name indicates advertiser in this issue. See advertiser index

DIRECTORY

COEN COMPANY, 40 Boardman St., San Francisco 3, Calif.

COMBUSTION EQUIPMENT DIV., TODD SHIPYARDS CORP., 81-16 45th Ave., Elmhurst, Queens, N. Y.

THE DENVER FIRE CLAY CO., 2301 Blake St., Denver 17, Colo.

●**KENNEDY VAN SAUN MFG. & ENG. CORP.,** 2 Park Ave., New York 16, N. Y.

JOHNSTON MFG. CO., 2825 E. Hennepin Ave., Minneapolis 13, Minn.

NATIONAL AIROIL BURNER CO., 1298 E. Sedgley Ave., Philadelphia 34, Pa.

●**F. L. SMIDTH & CO.,** 11 W. 42nd St., New York 18, N. Y.

STAPLES & PFEIFFER, 528 Bryant St., San Francisco 7, Calif.

THE STRONG-SCOTT MFG. CO., Northwestern Terminal, Minneapolis 13, Minn.

BURNERS, OIL, (see Oil Burners)

C

CABLE, Electric

ANACONDA WIRE & CABLE CO., 25 Broadway, New York 4, N. Y.

GENERAL CABLE CORP., 420 Lexington Ave., New York 17, N. Y.

●**GENERAL ELECTRIC CO.,** 1 River Road, Schenectady 5, N. Y.

GREENVILLE MFG WORKS, 112½ W. 4th St., Greenville, Ohio

ROCKBESTOS PRODUCTS CORP., Nicoll St., New Haven 4, Conn.

JOHN A. ROEBLING'S SONS CO., 640 S. Broad St., Trenton 2, N. J.

SIMPLEX WIRE & CABLE CO., 79 Sidney St., Cambridge 39, Mass.

UNITED STATES RUBBER CO., 1230 Ave. of the Americas, New York 20, N. Y.

WESTINGHOUSE ELECTRIC CO., First Nat'l Bank Bldg., Pittsburgh, Pa.

CABLE, ELECTRIC, ACCESSORIES, Connectors, Etc.

ALBERT & J. M. ANDERSON MFG. CO., 289-305 A St., Boston 10, Mass.

ANACONDA WIRE & CABLE CO., 25 Broadway, New York 4, N. Y.

●**GENERAL ELECTRIC CO.,** 1 River Road, Schenectady 5, N. Y.

WESTINGHOUSE ELECTRIC CO., First Nat'l Bank Bldg., Pittsburgh, Pa.

CABLE EXCAVATORS

●**BUCYRUS-ERIE CO.,** South Milwaukee, Wis.

THE HANSON CLUTCH & MACHINERY CO., Wall & Miami Streets, Tiffin 15, Ohio.

HENNEUSE ENGINEERING CO., Marion, Ohio

HYSTER COMPANY, 2918 N. E. Clackamas St., Portland 8, Ore.

JONES & LAUGHLIN STEEL CORP., Third Ave. & Ross St., Pittsburgh 30, Pa.

NORTHWEST ENGINEERING CO., 135 S. La Salle St., Chicago 3, Ill.

●**"QUICK-WAY" TRUCK SHOVEL CO.,** 2400 E. 40th Ave., Denver 5, Colo.

ROGERS IRON WORKS CO., 11th & Pearl Sts., Joplin, Mo.

●**SAUERMAN BROS., INC.,** 530 S. Clinton St., Chicago 7, Ill.

SUPERIOR - LIDGERWOOD - MUNDY CORP., Gray Building, Superior, Wis.

WOOLRIDGE MANUFACTURING CO., Sunnyvale, Calif.

CABLEWAYS

ATLAS CORPORATION, Mountville, Pa.

●**SAUERMAN BROS., INC.,** 530 S. Clinton St., Chicago 7, Ill.

U. S. STEEL CO., COLUMBIA-GENEVA STEEL DIV., Russ Bldg., San Francisco 6, Calif.

INTERSTATE EQUIPMENT DIV., YARA ENGINEERING CORP., 18 W. Jersey St., Elizabeth 4, N. J.

CALCIUM CHLORIDE

THE DOW CHEMICAL CO., Midland, Mich.

PITTSBURGH PLATE GLASS CO., COLUMBIA CHEMICAL DIV., Fifth Ave. at Bellefield, Pittsburgh 13, Pa.

●**SOLVAY SALES DIVN., ALLIED CHEMICAL & DYE CORP.,** 40 Rector St., New York 6, N. Y.

TAMMS INDUSTRIES, INC., 228 No. La Salle St., Chicago 1, Ill.

WYANDOTTE CHEMICALS CORP., MICHIGAN ALKALI DIV., Wyandotte, Mich.

CAPACITATORS, Electric

●**GENERAL ELECTRIC CO.,** 1 River Rd., Schenectady 5, N. Y.

CAPSTANS & WINCHES

ATLAS CORPORATION, Mountville, Pa.

THE C. O. BARTLETT AND SNOW CO., 6200 Harvard Ave., Cleveland 5, Ohio

BEEBE BROS., 2724 Sixth Ave. S., Seattle 4, Wash.

●**BUCYRUS-ERIE CO.,** South Milwaukee, Wis.

●**CHICAGO PNEUMATIC TOOL CO.,** 6 E. 44th St., New York 17, N. Y.

DOWNS CRANE & HOIST CO., 540 W. Vernon Ave., Los Angeles 37, Calif.

GAR WOOD INDUSTRIES, INC., Wayne Div., Wayne, Mich.

●**THE J. B. EHRSAM & SONS MFG. CO.,** Enterprise, Kans.

THE FOUR WHEEL DRIVE AUTO CO., Clintonville, Wis.

FRUEHAUF TRAILER CO., Detroit 32, Mich.

HYSTER CO., 2918 N.E. Clackamas, Portland 8, Ore.

●**JOY MANUFACTURING CO.,** Henry W. Oliver Bldg., Pittsburgh 22, Pa.

●**LINK-BELT CO.,** 300 W. Pershing Road, Chicago 9, Ill.

SHEPARD NILES CRANE & HOIST CORP., Schuyler Ave., Montour Falls, N. Y.

SILENT HOIST & CRANE CO., 879 63rd St., Brooklyn 20, N. Y.

STEPHENS-ADAMSON MFG. CO., 7 Ridgeway Ave., Aurora, Ill.

TULSA WINCH DIV. OF VICKERS, INC., 815 E. 1st St., Tulsa 3, Okla.

WEBSTER MFG. INC., Tiffin 16, Ohio

THE YALE & TOWNE MFG. CO., Philadelphia 15, Pa.

●**YUBA MFG. CO.,** 351 California St., San Francisco 4, Calif.

CAR COUPLINGS, WHEELS & LINERS

ATLAS CAR & MFG. CO., 1100 Ivanhoe Rd., Cleveland 10, Ohio

EASTON CAR & CONSTRUCTION CO., Easton, Pa.

PRESSED STEEL CAR CO., INC., 25 Broad St., New York 4, N. Y.

CAR DUMPERS

ATLAS CAR & MFG. CO., 1140 Ivanhoe Rd., Cleveland 10, Ohio

DIFFERENTIAL STEEL CAR CO., Findlay, Ohio

ELWELL-PARKER ELECTRIC CO., 4205 St. Clair Ave., Cleveland 8, Ohio

●**LINK-BELT CO.,** 300 W. Pershing Road, Chicago 9, Ill.

THE NOLAN CO., Bowerston, O.

PRESSED STEEL CAR CO., INC., 25 Broad St., New York 4, N. Y.

THE WELLMAN ENGINEERING CO., 7000 Central Ave., Cleveland 5, Ohio

CAR LOADERS (see Loaders, Car)

CAR MOVERS, Pullers

●**AMERICAN HOIST & DERRICK CO.,** 63 S. Robert St., St. Paul 1, Minn.

ARMSTRONG-BRAY & CO., 5364 Northwest Highway, Chicago 30, Ill.

ATLAS CORPORATION, Mountville, Pa.

THE C. O. BARTLETT AND SNOW CO., 6200 Harvard Ave., Cleveland 5, Ohio

CLYDE IRON WORKS, INC., P. O. Box 370, Duluth 1, Minn.

●**THE J. B. EHRSAM & SONS MFG. CO.,** Enterprise, Kans.

GODFREY CONVEYOR CO., 13th & Wolf Ave., Elkhart, Ind.

●**THE FRANK G. HOUGH CO.,** Sunnyside Ave., Libertyville, Ill.

INDUSTRIAL PRODUCTS CO., 2705 N. Fourth St., Philadelphia 33, Pa.

THE JEFFREY MFG. CO., 935 N. 4th St., Columbus 16, Ohio

W. A. JONES FOUNDRY & MACHINE CO., 4401 Roosevelt Rd., Chicago 24, Ill.

●**JOY MFG. CO.,** Henry W. Oliver Bldg., Pittsburgh 22, Pa.

KEWANEE MANUFACTURING CO., Department RP, Kewanee, Ill.

●**LINK-BELT CO.,** 300 W. Pershing Road, Chicago 9, Ill.

LULL MFG. CO., 3612 E. 44th St., Minneapolis 6, Minn.

SILENT HOIST & CRANE CO., 879 63rd St., Brooklyn 20, N. Y.

STEPHENS-ADAMSON MFG. CO., 7 Ridgeway Ave., Aurora, Ill.

THE WELLMAN ENG. CO., 7000 Central Ave., Cleveland 5, Ohio

CAR SHAKERS

●**ALLIS-CHALMERS MFG. CO.,** 975 So. 70th St., Milwaukee 1, Wis.

●**ROBINS CONVEYOR DIV., HEWITT-ROBINS INC.,** 270 Passaic Ave., Passaic, N. J.

●**LINK-BELT CO.,** 300 W. Pershing Road, Chicago 9, Ill.

NATIONAL CONVEYOR & SUPPLY CO., 350 N. Harding Ave., Chicago 24, Ill.

●**NEW HAVEN VIBRATOR CO.,** 145 Chestnut St., New Haven 7, Conn.

CARS, Concrete Products

ANCHOR CONCRETE MACHINERY CO., 1191 Fairview Ave., Columbus 12, Ohio

EASTON CAR & CONSTRUCTION CO., Easton, Pa.

MULTIPLEX MACHINERY CORP., Elmore, Ohio

PRESSED STEEL CAR CO., INC., 25 Broad St., New York 4, N. Y.

CARS, Dump

ATLAS CAR & MFG CO., 1140 Ivanhoe Rd., Cleveland 10, Ohio

BETHLEHEM STEEL CO., 701 E. Third St., Bethlehem, Pa.

THE CHASE FOUNDRY & MFG CO., 2300 S. Parsons Ave., Columbus 7, Ohio

DIFFERENTIAL STEEL CAR CO., Findlay, Ohio

EASTON CAR & CONSTRUCTION CO., Easton, Pa.

GREENVILLE MFG. WORKS, 112½ W. 4th St., Greenville, Ohio

PRESSED STEEL CAR CO.,INC., 25 Broad St., New York 4, N. Y.

UNITED IRON WORKS CO., 108 No. Locust, Pittsburg, Kans.

WIS. FOUNDRY & MACHINE CO., 623 E. Main St., Madison, Wis.

CARS, Electric, Remote Control

ATLAS CAR & MFG. CO., 1140 Ivanhoe Rd., Cleveland 10, Ohio

DIFFERENTIAL STEEL CAR CO., Findlay, Ohio

EASTON CAR & CONSTRUCTION CO., Easton, Pa.

●**GENERAL ELECTRIC CO.,** 1 River Rd., Schnectady 5, N. Y.

CARS, Mine, Quarry, Industrial

ATLAS CAR & MFG. CO., 1140 Ivanhoe Rd., Cleveland 10, Ohio

BAKER INDUSTRIAL TRUCK DIV., THE BAKER - RAULANG CO., 1250 W. 80th St., Cleveland 2, Ohio

THE C. O. BARTLETT AND SNOW CO., 6200 Harvard Ave., Cleveland 5, Ohio

BETHLEHEM STEEL CO., 701 E. Third St., Bethlehem, Pa.

THE C. S. CARD IRON WORKS CO., P.O. Box 117, Denver 1, Colo.

THE CHASE FOUNDRY & MFG. CO., 2300 S. Parsons Ave., Columbus 7, Ohio

DIFFERENTIAL STEEL CAR CO., Findlay, Ohio

●**EAGLE IRON WORKS,** 137 Holcomb Ave., Des Moines 4, Iowa

EASTON CAR & CONSTRUCTION CO., Easton, Pa.

GREENVILLE MFG. WORKS, 112½ W. 4th St., Greenville, Ohio

LANDIS STEEL CO., 116 W. A St., Picher, Okla.

PRESSED STEEL CAR CO., INC., 25 Broad St., New York 4, N. Y.

ROGERS IRON WORKS CO., 11th & Pearl Sts., Joplin, Mo.

UNITED IRON WORKS CO., 108 No. Locust, Pittsburg, Kans.

UNITED STATES STEEL CO., Pittsburgh 30, Pa.

WIS. FOUNDRY & MACHINE CO., 623 E. Main St., Madison, Wis.

CARS, Railroad, Retaining Doors, Strapping

BETHLEHEM STEEL CO., 701 E. Third St., Bethlehem, Pa.

SIGNODE STEEL STRAPPING CO., 2600 N. Western Ave., Chicago 47, Ill.

GREENVILLE MFG. WORKS, 112½ W. 4th St., Greenville, Ohio

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DIRECTORY

CARTRIDGES, Rotary, Kiln, Slag Removal

REMINGTON ARMS CO., INC., Barnum Ave., Bridgeport 2, Conn.

WINCHESTER REPEATING ARMS CO., 275 Winchester Ave., New Haven, Conn.

CASTINGS, Repair Parts

1. Bronze
2. Grey Iron
3. Heat Resisting Steel
4. Malleable
5. Manganese
6. Special Alloy
7. Steel

ALLOY RODS CO., 3105 W. Market St., York, Pa.
1

•**AMERICAN MANGANESE STEEL DIV OF AMERICAN BRAKE SHOE CO.,** 401 E. 14th St., Chicago Heights, Ill.
5

•**THE BABCOCK & WILCOX CO.,** 85 Liberty St., New York 6, N. Y.
3—6

THE BALDWIN LOCOMOTIVE WORKS, Philadelphia 42, Pa.
1—2—3—5—6—7

BETHLEHEM STEEL CO., 701 E. Third St., Bethlehem, Pa.
1—2—3—4—5—6—7

THE BONNOT CO., 722 Mulberry S.E., Canton 2, Ohio
2—7

•**CHAIN BELT CO.,** 1600 W. Bruce St., Milwaukee 4, Wis.

THE CHASE FOUNDRY & MFG. CO., 2300 S. Parsons Ave., Columbus 7, Ohio
2

CHICAGO STEEL FOUNDRY CO., 3720 S. Kedzie Ave., Chicago 32, Ill.
6—7

COAST METALS, INC., Little Ferry, N. J.
6

•**EAGLE IRON WORKS,** 137 Holcomb Ave., Des Moines 4, Iowa
1—2—5—7

•**THE J. B. EHRSAM & SONS MFG. CO.,** Enterprise, Kans.
2

THE EIMCO CORP., P. O. Box 300, Salt Lake City 10, Utah
2—3—6—7

ELECTRO-ALLOYS DIV., AMERICAN BRAKE SHOE CO., Taylor St., & Abbey Road, Elyria, Ohio
3

ERIE PUMP & ENGINE WORKS, 163 Glenwood Ave., Medero, N. Y.
1—2

•**FARRELL - BIRMINGHAM CO., INC.,** Ansonia, Conn.
2—6—7

THE FAHRALLOY CO., 149th Loomis St., Harvey, Ill.
3—6

FARRELL - CHEEK STEEL CO., Sandusky, Ohio
7

FREDERICH IRON & STEEL CO., Frederick, Md.
2

•**THE FROG, SWITCH & MFG. CO.,** Carlisle, Pa.
5

GEORGIA IRON WORKS CO., 605 12th St., Augusta, Ga.
2—6

GREENVILLE MFG. WORKS, 112½ W. 4th St., Greenville, Ohio
5—6—7

•**HARDINGE CO., INC.,** 240 Arch St., York, Pa.
2

HARDSOGG PNEUMATIC TOOL CO., 225 So. Benton St., Ottumwa, Iowa
2

HAYNES STELLITE CO., DIV. UNION CARBIDE & CARBON CORP., South Lindsay St., Kokomo, Ind.
6

•**IOWA MFG. CO.,** 916 16th St., N. E., Cedar Rapids, Iowa
2

THE JEFFREY MFG. CO., 935 N. 4th St., Columbus 16, Ohio
2—4

•**KENNEDY VAN SAUN MFG. & ENG. CORP.,** 2 Park Ave., New York 16, N. Y.
2

KENSINGTON STEEL CO., 505 Kensington St., Chicago 28, Ill.
5—6

•**LINK-BELT COMPANY,** 300 W. Pershing Rd., Chicago 9, Ill.
2—4—7

•**McLANAHAN AND STONE CORP.,** Hollidaysburg, Pa.
1—2

NATIONAL BEARING DIV., AM. BRAKE SHOE CO., 4930 Manchester St., St. Louis 10, Mo.
1

PEKOR IRON WORKS, Lock Drawer 909, Columbus, Ga.
1—2—6

THE PENNEBACKER CO., 3rd & Furnace Sts., Emmaus, Pa.
2

•**PETTIBONE MULLIKEN CORP., IMPACT MASTER DIVISION** 4710 W. Division St., Chicago 51, Ill.
5

PYOTT FOUNDRY & MACHINE CO., 328 No. Sangamon St., Chicago 7, Ill.
2

QUINN WIRE & IRON WORKS, Boone, Iowa
2

RESISTO-LOY CO., 127 Baylis St., S.W., Grand Rapids 7, Mich.
5

ROGERS IRON WORKS CO., 11th & Pearl Sts., Joplin, Mo.
2—6—7

•**F. L. SMIDTH & CO.,** 11 W. 42nd St., New York 18, N. Y.
1—2—3—4—5—6—7

SHEPPARD DIESELS, Philadelphia St., Hanover, Pa.
2

•**SMITH ENGINEERING WORKS,** 532 E. Capitol Dr., Milwaukee 12, Wis.
1—2—3—4—5—6—7

SPROUT, WALDRON & CO., INC., Muncy, Pa.
2

•**STEARNS MFG. CO., INC.,** 600 E. Beecher St., Adrian, Mich.
2—6

STEARNS - ROGERS MFG. CO., 1720 California St., Denver 2, Colo.
3

•**STOODY COMPANY,** 11929 E. Slauson Ave., Whittier, Calif.
6

•**STULZ-SICKLES CO.,** 134 Lafayette St., Newark 5, N. J.
5

•**THOMAS FOUNDRIES, INC.,** P.O. Box 1111, Birmingham 1, Ala.
2—6

THUNDER BAY MFG. CO., Box 317, Alpena, Mich.
2

•**TRAYLOR ENGINEERING & MFG. CO.,** Allentown, Pa.
6

UNITED IRON WORKS CO., 108 No. Locust, Pittsburg, Kans.
2

WALL COLMONOY CORP., 19345 John R. St., Detroit 3, Mich.
6

WIS. FOUNDRY & MACHINE CO., 623 E. Main St., Madison, Wis.
2

R. D. WOOD CO., 1072 Public Ledger Bldg., Philadelphia 5, Pa.
1—2

•**YUBA MFG. CO.,** 351 California St., San Francisco 4, Calif.
1—2

CEMENT COOLERS (see Coolers, Bulk Cement)

CEMENT DISPERSION AGENTS

AUTOLENE LUBRICANTS CO., PROTEX DIVN., 1331 W. Evans Ave., Denver 9, Colo.

DEWEY AND ALMY CHEMICAL CO., 62 Whittemore Ave., Cambridge 40, Mass.

A. C. HORN CO., INC., 10th St. & 44th Ave., Long Island City 1, N. Y.

JINKINS LABORATORY, 3620 W. Sixth St., Los Angeles 5, Cal.

•**THE MASTER BUILDERS CO.,** 7016 Euclid Ave., Cleveland 3, Ohio

MINERAL PIGMENTS CORP., Washington Blvd., Muirkirk, Md.

NOPCO CHEMICAL CO., Dept. RP, Harrison, N. J.

REARDON INDUSTRIES INC., 2837 Stanton Ave., Cincinnati 6, Ohio

SIKA CHEMICAL CORP., 35 Gregory Ave., Passaic, N. J.

SPRAY - O - BOND COMPANY, 2225 N. Humboldt Ave., Milwaukee 12, Wis.

CEMENT AND MASONRY COLORS

BLUE RIDGE TALC CO., INC., P.O. Box 7, Henry, Va.

CHASE CONCRETE MACHINERY CO., 94 Grandview Ave., Buffalo 23, N. Y.

COLORCRETE INDUSTRIES, INC., 24th & Ottawa Ave., Holland, Mich.

A. C. HORN CO., INC., 10th St. & 44th Ave., Long Island City 1, N. Y.

LANDERS-SEGAL COLOR CO., 78 Delevan St., Brooklyn 31, N. Y.

•**THE MASTER BUILDERS CO.,** 7016 Euclid Ave., Cleveland 3, Ohio

MINERAL PIGMENTS CORP., Washington Blvd., Muirkirk, Md.

MINNESOTA MINING & MFG. CO., 900 Fauguier Ave., St. Paul 6, Minn.

HYDRO-FORGED STONE ASSOCIATES, INC., 420 Bulkley Bldg., Cleveland 15, Ohio

REARDON INDUSTRIES INC., 2837 Stanton Ave., Cincinnati 6, Ohio

RICKETSON MINERAL COLOR WORKS, 229 E. Wisconsin Ave., Milwaukee 2, Wis.

J. LEE SMITH & CO., INC., 25 Ann Street, New York 38, N. Y.

L. SONNEBORN SONS, INC., 300 Fourth Ave., New York 10, N. Y.

TAMMS INDUSTRIES, INC., 228 No. LaSalle St., Chicago 1, Ill.

•**C. K. WILLIAMS & CO.,** 640 N. 13th St., Easton, Pa.

CEMENT PLANTS, Engineers & Contractors

W. R. BENDY, CEMENT PLANT ENGINEER, 9403 Riverview Dr., St. Louis 15, Mo.

E. LEE HEIDENREICH, JR., 67 Second St., Newburgh, N. Y.

THE HELTZEL STEEL FORM AND IRON CO., 1750 Thomas Road, Warren, Ohio

A. C. HORN CO., INC., 10th St. and 44th Ave., Long Island City 1, N. Y.

HYDROZO PRODUCTS, INC., 3230 University Ave., Madison, Wis.

•**THE C. S. JOHNSON CO.,** P. O. Box 71, Champaign, Ill.

•**KENNEDY VAN SAUN MFG. & ENG. CORP.,** 2 Park Ave., New York 16, N. Y.

HERBERT LAUER, CEMENT PLANT ENGINEER, 420 E. Walnut Lane, Philadelphia 44, Pa.

MACDONALD ENGINEERING CO., 188 W. Randolph St., Chicago 1, Ill.

PETTIBONE MULLIKEN CORP., 4710 Division St., Chicago 51, Ill.

•**ROBINS ENGINEERS DIV., HEWITT-ROBINS INC.,** 157 Chambers St., New York 7, N. Y.

WM. E. ROBINSON & CO., 3633 Spring Garden St., Philadelphia 4, Pa.

SEPARATION PROCESS CO., Fuller Bldg., Catasauqua, Pa.

•**F. L. SMIDTH & CO.,** 11 W. 42nd St., New York 18, N. Y.

SOUTHWESTERN ENG. CO., 4800 Santa Fe Ave., Los Angeles 58, Calif.

TRAYLOR ENGINEERING & MFG. CO., Allentown, Pa.

•**WESTERN MACHINERY CO.,** 760-766 Folsom St., San Francisco 7, Calif.

CEMENT PUMPS, Finished Cement (see Pumps, Cement)

CEMENT TESTING APPARATUS

AUTOLENE LUBRICANTS CO., PROTEX DIVN., 1331 W. Evans Ave., Denver 9, Colo.

BURRELL CORP., 1942 Fifth Ave., Pittsburgh 19, Pa.

CENTRAL SCIENTIFIC CO., 1700 Irving Park Rd., Chicago 13, Ill.

FISHER SCIENTIFIC CO., 717 Forbes St., Pittsbugh 19, Pa.

FORNEY'S INC., 209 Elm St., New Castle, Pa.

HUMBOLDT MFG. CO., 2014 N. Whipple St., Chicago 47, Ill.

PRECISION SCIENTIFIC CO., 3737 W. Cortland St., Chicago 47, Ill.

SODEMANN HEAT & POWER CO., 2306 Delmar Blvd., St. Louis 3, Mo.

CHAS. R. WATTS & CO., 4121 Sixth Ave., N. W. Seattle 7, Wash.

CENTRAL MIXING PLANTS, Concrete

BODINSON MFG. CO., 2401 Bayshore Blvd., San Francisco 24, Calif.

•**BLAW-KNOX DIV. OF BLAW-KNOX CO.,** P.O. Box 1198, Pittsburgh 30, Pa.

•**BUTLER BIN CO.,** Box 407, Waukesha, Wis.

•**CHAIN BELT CO.,** 1600 W. Bruce St., Milwaukee 4, Wis.

CONCRETE TRANSPORT MIXER CO., 4985 Fyler Ave., St. Louis, Mo.

CONSTRUCTION MACHINERY CO'S., Glenwood & Vinton Sts., Waterloo, Iowa

THE CONVEYOR CO., 3260 East Slauson Ave., Los Angeles 11, Calif.

DODSON MFG. CO., 1463 Barwise, Wichita 2, Kans.

ERIE STEEL CONST. CO., Giest Road & N. P. R. R., Erie, Pa.

GREENVILLE MFG. WORKS, 112½ W. 4th St., Greenville, Ohio

HARDY SCALES CO., 5701 So. Atlantic Blvd., Maywood, Calif.

THE HELTZEL STEEL FORM AND IRON CO., 1750 Thomas Road, Warren, Ohio

•**THE C. S. JOHNSON CO.,** P. O. Box 71, Champaign, Ill.

MIXERMOBILE MANUFACTURERS, 6855 N. E. Halsey St., P. O. Box 5108, Portland 16, Ore.

MULTIPLEX MACHINERY CORP., Elmore, Ohio

NOBLE CO., 1860 Seventh St., Oakland 20, Calif.

WM. E. ROBINSON & CO., 3633 Spring Garden St., Philadelphia 4, Pa.

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DIRECTORY

●**SuPREMIX, INC.,** 401 Grace St., Adrian, Mich.

WORTHINGTON PUMP & MACHINERY CORP., Worthington Ave., Harrison, N. J.

CENTRIFUGES, Cement Slurry, Etc.

BIRD MACHINE CO., South Walpole, Mass.

CENTRIFUGE MECHANICAL EQPT., INC., 95 River St., Hoboken, N. J.

MERCO CENTRIFUGAL CO., 1045 Sansome St., San Francisco 11, Calif.

SEPARATION PROCESS CO., Fuller Bldg., Catasauqua, Pa.

CHAIN, Dredge and Shovel

●**CHAIN BELT CO.,** 1600 W. Bruce St., Milwaukee 4, Wis.

THE CLEVELAND CHAIN & MFG. CO., 445 Henry St., Cleveland 5, Ohio

DIAMOND CHAIN CO., INC., 402 Kentucky Ave., Indianapolis 7, Ind.

●**EAGLE IRON WORKS,** 137 Holcomb Ave., Des Moines 4, Iowa

KENSINGTON STEEL CO., 505 Kensington St., Chicago 28, Ill.

●**LINK-BELT CO.,** 300 W. Pershing Road, Chicago 9, Ill.

MANGANESE STEEL FORGE CO., Richmond St. & Castor Ave., Philadelphia 34, Pa.

TAYLOR-WHARTON IRON & STEEL CO., High Bridge, N. J.

YAUN WELDING & DRAGLINE BUCKETS, INC., P.O. Box 1508, Baton Rouge, La.

CHAIN DRIVES (see Drives)

CHAIN, Elevating and Conveying

AMERICAN BRAKE SHOE CO., 230 Park Ave., New York 17, N. Y.

●**AMERICAN MANGANESE STEEL DIV., OF AMERICAN BRAKE SHOE CO.,** 401 E. 14th St., Chicago Heights, Ill.

ACME ROAD MACHINERY CO., East Main St., Frankfort, N. Y.

THE C. O. BARTLETT AND SNOW CO., 6200 Harvard Ave., Cleveland 5, Ohio

BEAUMONT BIRCH CO., 1512 Race St., Philadelphia 2, Pa.

●**CHAIN BELT CO.,** 1600 W. Bruce St., Milwaukee 4, Wis.

CHICAGO STEEL FOUNDRY CO., 3720 S. Kedzie Ave., Chicago 32, Ill.

THE CLEVELAND CHAIN & MFG. CO., 445 Henry St., Cleveland 5, Ohio

THE CONVEYOR CO., 3260 East Slauson Ave., Los Angeles 11, Calif.

DIAMOND CHAIN CO., INC., 402 Kentucky Ave., Indianapolis 7, Ind.

●**DIAMOND IRON WORKS, INC.,** 1728 2nd St. N., Minneapolis 11, Minn.

FARRELL - CHEEK STEEL CO., Sandusky, Ohio

GREENVILLE MFG. WORKS, 1121½ W. 4th St., Greenville, Ohio

THE JEFFREY MFG. CO., 935 N. 4th St., Columbus 16, Ohio

●**LINK-BELT CO.,** 300 W. Pershing Road, Chicago 9, Ill.

MANGANESE STEEL FORGE CO., Richmond St. & Castor Ave., Philadelphia 34, Pa.

JOSEPH T. RYERSON & SON, INC., 2558 W. 16th St., Chicago 80, Ill.

●**SMITH ENGINEERING WORKS,** 532 E. Capitol Dr., Milwaukee 12, Wis.

SPROUT, WALDRON & CO., INC., Muncy, Pa.

STEPHENS-ADAMSON MFG. CO., 7 Ridgeway Ave., Aurora, Ill.

●**TAYLOR - WHARTON IRON & STEEL CO.,** High Bridge, N. J.

TRIANGLE ENGINEERING CO., 2848 W. 26th St., Chicago 23, Ill.

CHAIN, Heat Exchanger

●**F. L. SMIDTH & CO.,** 11 W. 42nd St., New York 18, N. Y.

CHAIN LINKS, Fittings, Hooks, Etc.

AMERICAN CHAIN DIV., AMERICAN CHAIN & CABLE CO., INC., York, Pa.

●**AMERICAN MANGANESE STEEL DIV. OF AMERICAN BRAKE SHOE CO.,** 401 E. 14th St., Chicago Heights, Ill.

●**CHAIN BELT CO.,** 1600 W. Bruce St., Milwaukee 4, Wis.

THE CLEVELAND CHAIN & MFG. CO., 445 Henry St., Cleveland 5, Ohio

THE JEFFREY MFG. CO., 935 N. 4th St., Columbus 16, Ohio

●**THE THOMAS LAUGHLIN CO.,** 143 Fore St., Portland 6, Me.

MANGANESE STEEL FORGE CO., Richmond St. & Castor Ave., Philadelphia 34, Pa.

CHAINS, Drag

AMERICAN CHAIN DIV., AMERICAN CHAIN & CABLE CO., INC., York, Pa.

●**AMERICAN MANGANESE STEEL DIV. OF AMERICAN BRAKE SHOE CO.,** 401 E. 14th St., Chicago Heights, Ill.

THE C. O. BARTLETT AND SNOW CO., 6200 Harvard Ave., Cleveland 5, Ohio

CARLYLE RUBBER CO., INC., 62-66 Park Pl., New York 7, N. Y.

●**CHAIN BELT CO.,** 1600 W. Bruce St., Milwaukee 4, Wis.

THE CLEVELAND CHAIN & MFG. CO., 445 Henry St., Cleveland 5, Ohio

CHICAGO STEEL FOUNDRY CO., 3720 S. Kedzie Ave., Chicago 32, Ill.

FARRELL - CHEEK STEEL CO., Sandusky, Ohio

GENERAL CONVEYOR & MFG. CO., 3601 Salena St., St. Louis 18, Mo.

THE JEFFREY MFG. CO., 935 N. 4th St., Columbus 16, Ohio

●**LINK-BELT CO.,** 300 W. Pershing Road, Chicago 9, Ill.

MANGANESE STEEL FORGE CO., Richmond St. & Castor Ave., Philadelphia 34, Pa.

●**SMITH ENGINEERING WORKS,** 532 E. Capitol Dr., Milwaukee 12, Wis.

SPROUT, WALDRON & CO., INC., Muncy, Pa.

●**TAYLOR-WHARTON IRON & STEEL CO.,** High Bridge, N. J.

CHUTE LININGS, Rubber

CARLYLE RUBBER CO., INC., 62-66 Park Pl., New York 7, N. Y.

THE CINCINNATI RUBBER MFG. CO., Franklin Ave., Cincinnati 12, Ohio

●**THE FIRESTONE TIRE & RUBBER CO.,** 1200 Firestone Pkwy., Akron 17, Ohio

THE GALIGHER COMPANY, 545 W. 8th South, Salt Lake City, Utah

THE GATES RUBBER CO., 999 S. Broadway, Denver 17, Colo.

GOODALL RUBBER CO., Whitehead Road, Trenton 4, N. J.

●**THE GOODYEAR TIRE & RUBBER CO., INC.,** 1144 E. Market St., Akron 16, Ohio

HAMILTON RUBBER MFG. CORP., Mead St., Trenton 3, N. J.

●**HEWITT RUBBER DIV., HEWITT-ROBINS INC.,** 240 Kensington Ave., Buffalo 5, N. Y.

QUAKER RUBBER CORP., Tacony & Comly Sts., Philadelphia 24, Pa.

●**REPUBLIC RUBBER DIV., LEE RUBBER & TIRE CORP.,** Albert St., Youngstown 1, Ohio

●**SMITH ENGINEERING WORKS,** 532 E. Capitol Dr., Milwaukee 12, Wis.

●**THERMOID COMPANY,** Trenton, N. J.

UNITED STATES RUBBER CO., 1230 Ave. of the Americas, New York 20, N. Y.

CHUTE LININGS, Other

ALLIED STEEL PRODUCTS, INC., 7835 Broadway, Cleveland 5, Ohio

AMERICAN BRAKE SHOE CO., 230 Park Ave., New York 17, N. Y.

●**AMERICAN MANGANESE STEEL DIV. OF AMERICAN BRAKE SHOE CO.,** 401 E. 14th St., Chicago Heights, Ill.

THE CARBORUNDUM CO., REFRACTORIES DIVN., Perth Amboy, N. J.

●**DIAMOND IRON WORKS, INC.,** 1728 2nd St., N., Minneapolis 11, Minn.

●**THE FROG, SWITCH & MFG. CO.,** Carlisle, Pa.

GAR-BRO MFG. CO., 2416 E. 16th St., Los Angeles 21, Calif.

GREENVILLE MFG. WORKS, 1121½ W. 4th St., Greenville, Ohio

●**IOWA MFG. CO.,** 916 16th St., N. E., Cedar Rapids, Iowa

KENSINGTON STEEL CO., 505 Kensington St., Chicago 28, Ill.

LUKENS STEEL CO., 521 Lukens Bldg., Coatesville, Pa.

MANGANESE STEEL FORGE CO., Richmond St. & Castor Ave., Philadelphia 34, Pa.

●**McLANAHAN AND STONE CORP.,** Hollidaysburg, Pa.

●**SMITH ENGINEERING WORKS,** 532 E. Capitol Dr., Milwaukee 12, Wis.

STULZ-SICKLES CO., 134 Lafayette St., Newark 5, N. J.

●**TAYLOR - WHARTON IRON & STEEL CO.,** High Bridge, N. J.

●**THOMAS FOUNDRIES, INC.,** P.O. Box 1111, Birmingham 1, Ala.

●**YUBA MFG. CO.,** 351 California St., San Francisco 4, Cal.

CHUTES

AMERICAN VENTILATING HOSE CO., 100 Park Ave., New York 7, N. Y.

●**BAUGHMAN MFG. CO., INC.,** 1000 Shipman Rd., Jerseyville, Ill.

CONCRETE TRANSPORT MIXER CO., 4985 Fyler Ave., St. Louis 9, Mo.

●**CONTINENTAL GIN CO.,** 4500 5th Ave. S., Birmingham, Ala.

●**DIAMOND IRON WORKS, INC.,** 1728 2nd St. N., Minneapolis 11, Minn.

●**THE J. B. EHRSAM & SONS MFG. CO.,** Enterprise, Kans.

●**THE FROG, SWITCH & MFG. CO.,** Carlisle, Pa.

GAR-BRO MFG. CO., 2416 E. 16th St., Los Angeles 21, Calif.

GREENVILLE MFG. WORKS, 1121½ W. 4th St., Greenville, Ohio

THE HELTZEL STEEL FORM AND IRON CO., 1750 Thomas Road, Warren, Ohio

●**ROBINS CONVEYOR DIV., HEWITT-ROBINS INC.,** 270 Passaic Ave., Passaic, N. J.

●**IOWA MFG. CO.,** 916 16th St., N. E., Cedar Rapids, Iowa

THE JEFFREY MFG. CO., 935 N. 4th St., Columbus 16, Ohio

THE KIRK & BLUM MFG. CO., 3120 Forrer, Cincinnati 9, Ohio

LUKENS STEEL CO., 521 Lukens Bldg., Coatesville, Pa.

MANGANESE STEEL FORGE CO., Richmond St. & Castor Ave., Philadelphia 34, Pa.

E. F. MARSH ENG. CO., 4324 W. Clayton Ave., St. Louis 10, Mo.

MIXERMOBILE MANUFACTURERS, 6855 N. E. Halsey St., P. O. Box 5108, Portland 16, Ore.

PIONEER ENG. WORKS, INC., 1515 Central Ave., Minneapolis 13, Minn.

WM. E. ROBINSON & CO., 3307 Spring Garden St., Philadelphia 4, Pa.

●**SMITH ENGINEERING WORKS,** 532 E. Capitol Dr., Milwaukee 12, Wis.

STANDARD CONVEYOR CO., 315 N. W. Second, North St. Paul 9, Minn.

STEPHENS-ADAMSON MFG. CO., 7 Ridgeway Ave., Aurora, Ill.

STURTEVANT MILL CO., 102 Clayton St., Boston 22, Mass.

TROWBRIDGE CONVEYOR CO., 851 Van Houten Ave., Clifton, N. J.

UNITED IRON WORKS CO., 108 No. Locust, Pittsburg, Kans.

WIS. FOUNDRY & MACHINE CO., 623 E. Main St., Madison, Wis.

●**YUBA MFG. CO.,** 351 California St., San Francisco 4, Calif.

CHUTES, Spiral

ROBERT HOLMES & BROS., INC., 3519 Junction Ave., Danville, Ill.

CIRCUIT BREAKERS, Electric

●**ALLIS-CHALMERS MFG. CO.,** 975 So. 70th St., Milwaukee 1, Wis.

●**GENERAL ELECTRIC CO.,** 1 River Road, Schenectady 5, N. Y.

WESTINGHOUSE ELECTRIC CO., First Nat'l Bank Bldg., Pittsburgh, Pa.

CIRCUIT TESTERS, Electric

●**GENERAL ELECTRIC CO.,** 1 River Road, Schenectady 5, N. Y.

WESTINGHOUSE ELECTRIC CO., First Nat'l Bank Bldg., Pittsburgh, Pa.

CLARIFIERS, AIR (see Air Filters)

CLARIFIERS, Oil (see Air Filters)

CLASSIFIERS

1. Air
2. Electrostatic
3. Hydraulic

ALLEN CONE & MACHINERY CORP., 120 Broadway, New York 5, N. Y.
2

●**AMERICAN CYANAMID CO., MINERAL DRESSING DIV.,** 30 Rockefeller Plaza, New York 20, N. Y.
1—2—3

BIRD MACHINE CO., South Walpole, Mass.
3

● A dot before name indicates advertiser in this issue. See advertiser index.

DIRECTORY

COLORADO IRON WORKS CO., 1624 17th St., Denver 2, Colo.
2

THE CONVEYOR CO., 3260 East Slauson Ave., Los Angeles 11, Calif.
2

THE DEISTER CONCENTRATOR CO., 935 Glascow Ave., Fort Wayne 1, Ind.
3

•**DEISTER MACHINE CO.,** 1933 East Wayne St., Fort Wayne 4, Ind.
3

•**DENVER EQUIPMENT CO.,** 1410 Seventeenth St., Denver 17, Colo.

•**THE DOOR CO., ENGINEERS,** Barry Place, Stamford, Conn.
3

FEDERAL CLASSIFIER SYSTEMS, INC., 127 N. Dearborn St., Chicago 2, Ill.

•**HARDINGE CO., INC.,** 240 Arch St., York, Pa.
1—3

NICHOLS ENGINEERING & RESEARCH CORP., 70 Pine St., New York 5, N. Y.
3

•**RAYMOND PULVERIZER DIV., COMBUSTION ENG. SUPERHEATER, INC.,** 1315 N. Branch St., Chicago 22, Ill.
1

SEPARATIONS ENGINEERING CORP., 110 E. 42nd St., New York 17, N. Y.
1—2

•**SMITH ENGINEERING WORKS,** 532 E. Capitol Dr., Milwaukee 12, Wis.
3

STEARNS MAGNETIC MFG. CO., 675 S. 28th St., Milwaukee 46, Wis.

STURTEVANT MILL CO., 102 Clayton St., Boston 22, Mass.
1

•**WESTERN MACHINERY CO.,** 760 Folsom St., San Francisco 7, Cal.
3

•**WILLIAMS PATENT CRUSHER & PULV. CO.,** 800 St. Louis Ave., St. Louis 6, Mo.
1

CLASSIFIERS, SAND (see Sand Recovery Machinery)

CLEANING MACHINES, Bag (see Bag Cleaners)

CLINKER COOLERS

1. Grate
2. Rotary

•**ALLIS-CHALMERS MFG. CO.,** 975 So. 70th St., Milwaukee 1, Wis.
1—2

THE BONNOT CO., 722 Mulberry, S.E., Canton 2, Ohio
2

THE CONVEYOR CO., 3260 East Slauson Ave., Los Angeles 11, Calif.
1

•**FULLER COMPANY,** Fuller Bldg., Catasauqua, Pa.
1

•**HARDINGE CO., INC.,** 240 Arch St., York, Pa.
2

•**KENNEDY VAN SAUN MFG. & ENG. CORP.,** 2 Park Ave., New York 16, N. Y.
2

MANITOWOC ENGINEERING WORKS, Manitowoc, Wis.
1—2

McDERMOTT BROS. CO., Ft. of Washington St., Allentown, Pa.
2

•**NORDBERG MFG. CO.,** 3073 So. Chase Ave., Milwaukee 7, Wis.
2

•**F. L. SMIDTH & CO.,** 11 W. 42nd St., New York 18, N. Y.
1—2

•**TRAYLOR ENGINEERING & MFG. CO.,** Allentown, Pa.
2

UNITED IRON WORKS CO., 108 No. Locust, Pittsburg, Kans.
2

•**VULCAN IRON WORKS,** 700 So. Main St., Wilkes-Barre, Pa.
2

WEBBER EQUIPMENT CORP., 10 E. 44th St., New York 17, N. Y.
2

WESTERN PRECIPITATION CORP., 1016 W. Ninth St., Los Angeles 15, Calif.
2

CLIPS, WIRE ROPE (see Wire Rope Fittings)

CLOTH, WIRE (see Wire Cloth)

CLUTCH FACINGS (see Brake Linings)

CLUTCHES

THE C. O. BARTLETT AND SNOW CO., 6200 Harvard Ave., Cleveland 5, Ohio

•**DIAMOND IRON WORKS, INC.,** 1728 2nd St. No., Minneapolis 11, Minn.

DODGE MANUFACTURING CORP., Mishawaka, Ind.

DYNAMATIC CORP., 3307 14th Ave., Kenosha, Wis.

•**THE J. B. EHRSAM & SONS MFG. CO.,** Enterprise, Kans.

THE HANSON CLUTCH & MACHINERY CO., Wall and Miami Streets, Tiffen 15, Ohio

•**HARDINGE CO., INC.,** 240 Arch St., York, Pa.

THE JEFFREY MFG. CO., 935 N. 4th St., Columbus 16, Ohio

W. A. JONES FOUNDRY & MACHINE CO., 4401 Roosevelt Rd., Chicago 24, Ill.

•**LINK-BELT CO.,** 300 W. Pershing Road, Chicago 9, Ill.

THE MEDART CO., 100 Potomac St., St. Louis 18, Mo.

MERCURY CLUTCH DIV., AUTOMATIC STEEL PRODUCTS, INC., 1201 Camden Ave., S. W., Canton 6, Ohio

MORSE CHAIN CO., 7601 Central Ave., Detroit 10, Mich.

STEARNS MAGNETIC MFG. CO., 675 S. 28th St., Milwaukee 46, Wis.

YUBA MFG. CO., 351 California St., San Francisco 4, Calif.

COAL PULVERIZING EQUIPMENT

•**THE BABCOCK & WILCOX CO.,** 85 Liberty St., New York 6, N. Y.

THE C. O. BARTLETT AND SNOW CO., 6200 Harvard Ave., Cleveland 5, Ohio

THE BONNOT CO., 722 Mulberry, S.E., Canton 2, Ohio

•**GRUENDLER CRUSHER & PULVERIZER CO.,** 2915-17 N. Market St., St. Louis 6, Mo.

•**HARDINGE CO., INC.,** 240 Arch St., York, Pa.

•**HAMMERMILLS, INC., DIV. PETTIBONE MULLIKEN CORP.,** 4710 W. Division St., Chicago 51, Ill.

•**IOWA MFG. CO.,** 916 16th St. N. E., Cedar Rapids, Iowa

THE JEFFREY MFG. CO., 935 N. 4th St., Columbus 16, Ohio

•**KENNEDY VAN SAUN MFG. & ENG. CORP.,** 2 Park Ave., New York 16, N. Y.

McNALLY PITTSBURGH MFG. CORP., Pittsburgh, Kans.

•**PETTIBONE MULLIKEN CORP., IMPACT MASTER DIV.,** 4710 Division St., Chicago 51, Ill.

•**RAYMOND PULVERIZER DIV., COMBUSTION ENG. SUPERHEATER INC.,** 1315 N. Branch St., Chicago 22, Ill.

ROGERS IRON WORKS CO., 11th & Pearl Sts., Joplin, Mo.

STURTEVANT MILL CO., 102 Clayton St., Boston 22, Mass.

•**F. L. SMIDTH & CO.,** 11 W. 42nd St., New York 18, N. Y.

THE STRONG-SCOTT MFG CO., Northwestern Terminal, Minneapolis 13, Minn.

WHITING CORP., 15693 Lathrop Ave., Harvey, Ill.

•**WILLIAMS PATENT CRUSHER & PULV. CO.,** 800 St. Louis Ave., St. Louis 6, Mo.

COAL PULVERIZING EQUIPMENT, Direct-Firing Unit Mills

•**THE BABCOCK & WILCOX CO.,** 85 Liberty St., New York 6, N. Y.

•**HARDINGE CO., INC.,** 240 Arch St., York, Pa.

•**KENNEDY VAN SAUN MFG. & ENG. CORP.,** 2 Park Ave., New York 16, N. Y.

•**RAYMOND PULVERIZER DIV., COMBUSTION ENG. SUPERHEATER INC.,** 1315 N. Branch St., Chicago 22, Ill.

•**F. L. SMIDTH & CO.,** 11 W. 42nd St., New York 18, N. Y.

THE STRONG-SCOTT MFG. CO., Northwestern Terminal, Minneapolis 13, Minn.

WHITING CORP., 15693 Lathrop Ave., Harvey, Ill.

COLORS, Cement (see Cement and Masonry Colors)

COMMUNICATIONS SYSTEMS

FARMERS ENG. & MFG. CO., 549 Brushton Ave., Pittsburgh 21, Pa.

•**GENERAL ELECTRIC CO.,** 1 River Rd., Schenectady 5, N. Y.

CONCENTRATING TABLES

ALLEN CONE & MACHINERY CORP., 120 Broadway, New York 5, N. Y.

THE DEISTER CONCENTRATOR CO., 935 Glascow, Fort Wayne 1, Ind.

•**DEISTER MACHINE CO.,** 1933 East Wayne St., Fort Wayne 4, Ind.

•**DENVER EQUIPMENT CO.,** 1410 Seventeenth St., Denver 17, Colo.

GENERAL ENGINES CO., INC., 307 Hunter St., Gloucester, N. J.

THE MINE & SMELTER SUPPLY CO., 1422 17th St., Denver 17, Colo.

OVERSTROM & SONS, 2213 W. Mission Road, Alhambra, Calif.

SEPARATION PROCESS CO., Fuller Bldg., Catasauqua, Pa.

SEPARATIONS ENGINEERING CORP., 110 E. 42nd St., New York **CO.,** 110 E. 42nd St., New York 17, N. Y.

STEARNS-ROGERS MFG. CO., 1720 California St., Denver 2, Colo.

STRAUB MFG. CO., 456 Chestnut St., Oakland 7, Calif.

•**YUBA MFG. CO.,** 351 California St., San Francisco 4, Calif.

CONCRETE BLOCK MACHINES (See Block Machines)

CONCRETE CONTROL Systems, Quality

AUTOMATIC LIQUID METER CO., 1372-1378 E. 15th St., Los Angeles 21, Calif.

CARLYLE RUBBER CO., 64 Park Place, New York 7, N. Y.

FORNEY'S INC., 209 Elm St., New Castle, Pa.

•**M & M ENGINEERING CORP.,** 3928 Millersville Rd., Indianapolis 5, Ind.

SCIENTIFIC CONCRETE SERVICE CORP., 724 Salem Ave., Elizabeth 3, N. J.

•**SuPREMIX, INC.,** 401 Grace St., Adrian, Mich.

CONCRETE, Dry-Batched

SAKRETE INC., Fischer Ave. & B. & O. Ry., Cincinnati 17, Ohio

CONCRETE MASONRY REINFORCING

ADRIAN PEERLESS, INC., Adrian, Miss.

BETHLEHEM STEEL CO., 701 Third St., Bethlehem, Pa.

THE CARTER-WATERS CORP., 2440 Pennway, Kansas City 8, Mo.

HYDRO-FORGED STONE ASSOCIATES, INC., 420 Bulkley Bldg., Cleveland 15, Ohio

TRUSCON STEEL CO., Albert St., Youngstown 1, Ohio

R. K. TYRA CORP., Tyra, Minn.

CONCRETE MIXERS

1. Block Plant
2. Continuous
3. Job, Portable

ANCHOR CONCRETE MACHINERY CO., 1191 Fairview Ave., Columbus 12, Ohio
1—2—3

•**BESSER MFG. CO.,** Alpena, Mich.
1

BETHLEHEM STEEL CO., 701 E. Third St., Bethlehem, Pa.

CHASE CONCRETE MACHINERY CO., 94 Grandview Ave., Buffalo 23, N. Y.
1

GEO. C. CHRISTOPHER & SON IRON WORKS CO., 1220 Blaine, Wichita 1, Kans.
1—2—3

COLORCRETE INDUSTRIES, INC., 24th & Ottawa Ave., Holland, Mich.
1

•**COLUMBIA MACHINE WORKS,** 107 S. Grand Ave., Vancouver, Wash.
1

•**CONCRETE MACHINERY CO.,** P.O. Box 2248, Hickory, N. C.
2

CONCRETE TRANSPORT MIXER CO., 4985 Fyler Ave., St. Louis, Mo.
1

CONSTRUCTION MACHINERY CO'S., Glenwood & Vinton Sts., Waterloo, Iowa
1—2—3

•**DES PLAINES CONCRETE MACHINERY CO.,** P.O. Box 152, Des Plaines, Ill.
1

THE DODSON MFG. CO., 1463 Barwise Ave., Wichita 2, Kans.
1

W. E. DUNN MFG. CO., 550 W. 23rd St., Holland, Mich.
1

• A dot before name indicates advertiser in this issue. See advertiser index.

DIRECTORY

●**FLEMING MFG. CO.,** 4985 Fyler Ave., St. Louis, Mo.
1

GENERAL ENGINES CO., 307 Hunter St., Gloucester, N. J.
1

F. C. GEORGE MACHINE CO., INC., 100 S. Westmoreland Dr. Orlando, Fla.
1

GILSON BROTHERS CO., Fredonia, Wis.
3

HYDRO-FORGED STONE ASSOCIATES, INC., 420 Bulkley Bldg., Cleveland 15, Ohio
1

JACKSON & CHURCH CO., 321 N. Hamilton Ave., Saginaw Mich.
1

●**THE JAEGER MACHINE CO.,** 550 W. Spring St., Columbus 16, Ohio
3

●**THE KENT MACHINE CO.,** 113 Portage Trail, Cuyahoga Falls, O
1—2—3

●**THE KNICKERBOCKER CO.,** 603 Liberty St., Jackson, Mich.
3

●**KWIK-MIX COMPANY,** 235 W. Grand Ave., Port Washington Wis.
3—1—2

THE MILES MFG. CO., 545-7 Hupp Ave., Jackson, Mich.
1

LESLIE C. MILLER SUPPLY INC., P. O. Box 7, Bedford, Ohio
1

MISHCO CORP., 615 SW 2nd Ave., Miami, Fla.
1

MIXERMOBILE MANUFACTURERS, 6855 N. E. Halsey St., P.O. Box 5108, Portland 16, Ore.

●**MULTIPLEX MACHINERY CORP.,** Elmore, Ohio
1—2—3

THE GENE OLSEN CORP., 401 Grace St., Adrian, Mich.
1

●**PRASCHAK MACHINE CO.,** Marshfield, Wis.
1

●**THE T. L. SMITH CO.,** 2835 N 32nd St., Milwaukee 45, Wis.
1—2—3

SPEEDBLOCK, INC., 1144 Union Commerce Bldg., Cleveland 14, Ohio
1

●**STEARNS MFG. CO., INC.,** 600 E. Beecher St., Adrian, Mich.
1

●**SuPREMIX, INC.,** 401 Grace St., Adrian, Mich.

R. K. TYRA, Tyra, Minn.

UNIVERSAL CONCRETE MCHY. CO., INC., 297 S. High St., Columbus 15, Ohio
2

WITTEMANN MACHINERY CO., Paynters Rd., Farmingdale, N. J.
1—2—3

WORTHINGTON PUMP & MACHINERY CORP., Worthington Ave., Harrison, N. J.
2—3

THE YODER CO., 5552 Walworth Ave., Cleveland, Ohio
2

CONCRETE MIXERS, Truck (see Bodies, Ready Mixed Concrete)

CONCRETE MIXING PLANTS (see Central Mixing Plants)

CONCRETE PAINTS AND COATINGS

AMERICAN FLURESIT CO., INC., 4011 Red Bank Rd., Cincinnati 27, Ohio

THE CARTER-WATERS CORP., 2440 Pennway, Kansas City 8, Mo.

COLORCRETE INDUSTRIES, INC., 24th & Ottawa Ave., Holland, Mich.

W. E. DUNN MFG. CO., 550 W. 23rd St., Holland, Mich.

A. C. HORN CO., INC., 10th St. & 44th Ave., Long Island City 1, N. Y.

HYDRO-FORGED STONE ASSOCIATES, INC., 420 Bulkley Bldg., Cleveland 15, Ohio

HYDROZO PRODUCTS, INC., 3230 University Ave., Madison, Wis.

KAY-TITE CO., 10 White St., West Orange, N. J.

KOPPERS CO., INC., Koppers Bldg., Pittsburgh 19, Pa.

●**THE MASTER BUILDERS CO.,** 7016 Euclid Ave., Cleveland 3, Ohio

REARDON INDUSTRIES INC., 2837 Stanton Ave., Cincinnati 6, Ohio

SIKA CHEMICAL CORP., 35 Gregory Ave., Passaic, N. J.

L. SONNEBORN SONS, INC., 300 Fourth Ave., New York 10, N. Y.

SPRAY-O-BOND COMPANY, 2225 N. Humboldt Ave., Milwaukee 12, Wis.

TAMMS INDUSTRIES, INC., 228 No. LaSalle St., Chicago 1, Ill.

TRUSCON LABORATORIES, Caniff & G. T. R. R., Detroit 12, Mich.

CONCRETE PREMIX PLANTS, Dry

●**BUTLER BIN CO.,** Box 407, Waukesha, Wis.

●**SuPREMIX, INC.,** 401 Grace St., Adrian, Mich.

CONCRETE PRODUCTS CURING EQUIPMENT (see Kilns, Concrete Curing)

CONCRETE PRODUCTS HANDLING EQUIPMENT

ANCHOR CONCRETE MACHINERY CO., 1191 Fairview Ave., Columbus 12, Ohio

●**BARBER-GREENE CO.,** 631 W. Park Ave., Aurora, Ill.

THE C. O. BARTLETT AND SNOW CO., 6200 Harvard Ave., Cleveland 5, Ohio

●**BESSER MFG. CO.,** 205 47th St., Alpena, Mich.

CARPENTER MFG. CO., R. F. D. No. 1, Box 470, Richmond 23, Va.

CHASE CONCRETE MACHINERY CO., 94 Grandview Ave., Buffalo 23, N. Y.

CONSTRUCTION PRODUCTS CORP., 410 San Fernando Road, Los Angeles 31, Calif.

EASTON CAR & CONSTRUCTION CO., Easton, Pa.

GENERAL ENGINES CO., NC., 307 Hunter St., Gloucester, N. J.

GAR-BRO MFG. CO., 2416 E. 16th St., Los Angeles 21, Calif.

THE HANSON CLUTCH & MACHINERY CO., Wall & Miami Streets, Tiffin 15, Ohio

ROBINS CONVEYORS DIV., HEWITT-ROBINS INC., 270 Passaic Ave., Possaic, N. J.

●**THE FRANK G. HOUGH CO.,** Sunnyside Ave., Libertyville, Ill.

HYSTER COMPANY, 2918 N. E. Clackamas St., Portland 8, Ore.

INSLEY MFG. CORP., 801 N. Olney, Indianapolis 1, Ind.

JACKSON & CHURCH CO., 321 N. Hamilton St., Saginaw, Mich.

LEWIS-SHEPARD PRODUCTS INC., 206 Walnut St., Watertown 72, Mass.

LULL MFG. CO., 3612 E. 44th St., Minneapolis 6, Minn.

MULTIPLEX MACHINERY CORP., Elmore, Ohio

NORTHWEST CONCRETE PRODUCTS EQUIPMENT CO., 2800 Cooper Ave. N., St. Cloud, Minn.

THE GENE OLSEN CORP., 401 Grace St., Adrian, Mich.

THE PRIME-MOVER CO., Muscatine, Iowa

SCHMIDGALL MFG. CO., INC. FORK DIV., 307 Cass, Peoria 2, Ill.

●**SCHONROCK EQUIPMENT MFG. CO.,** P.O. Box 1543, San Angelo, Texas

●**STEARNS MFG. CO., INC.,** 600 E. Beecher St., Adrian, Mich.

WITTEMANN MACHINERY CO., Paynters Rd., Farmingdale, N. J.

CONCRETE SPECIALTY FORMS:

A. Bins, Tanks, Silos
1. Burial Vault
2. Cribbing
3. Curb & Gutter
4. Fence Posts & Poles
5. Floor System
6. Floor & Roof Slab
7. Garbage Disposal Unit
8. Garden & Ornamental Furniture
9. Joist
10. Laundry Tray
11. Manhole, Curbing & Blocks
12. Partition
13. Pipe, Culvert & Sewer
14. Septic Tank
15. Sill & Lintel
16. Step, Precast
17. Tile & Conduit
18. Walls, Foundation

AMERICAN VAULT CO., 579 Kenilworth, Detroit 2, Mich.
1—7—14

ANCHOR CONCRETE MACHINERY CO., 1191 Fairview, Columbus 12, Ohio
11

ASHLAND VAULT INC., 500-518 Virginia Ave., Ashland 4, Ohio
1—10—14

AUTOLENE LUBRICANTS CO., PROTEX DIVN., 1331 W. Evans Ave., Denver 9, Colo.
13

THE AUTOMATIC SEALING VAULT CO., Peru, Indiana
1—14

BASALT ROCK CO., INC., 8th & River Sts., Napa, Calif.
5—6

●**BERG VAULT CO.,** 1620 Lucas Hunt Rd., St. Louis 20, Mo.
1—14

BERGEN MACHINE & TOOL CO., INC., 189 Franklin Ave., Nutley 10, N. J.
11

●**BESSER MFG. CO.,** Alpena, Mich.
5

●**CARPENTER MFG. CO.,** R. F. D. No. 1, Box 470, Richmond 23, Va.
14

CHASE CONCRETE MACHINERY CO., 94 Grandview Ave., Buffalo 23, N. Y.
1—4—6—8—10
14—15—16—17—18

COLORCRETE INDUSTRIES, INC., 24th & Ottawa Ave., Holland, Mich.
8—11

●**CONCRETE EQUIPMENT CO.,** Holland, Mich.
8

CONCRETE FORMS CORP., 20 Vesey St., New York 7, N. Y.
A—13—18

CONCRETE INDUSTRIES, INC., 15025 Oxnard St., Van Nuys, Calif.
3—4—8—11—15—16

●**CONCRETE MACHINERY CO.,** P.O. Box 2248, Hickory 7, N. C.
8—13—17

CURRIER'S ENTERPRISES, 4301 San Fernando Road, Glendale 4, Calif.
7

●**DES PLAINES CONCRETE MACHINERY CO.,** 930 North Ave., Des Plaines, Ill.
8—11

THE FLEXICORE CO., INC., 1932 E. Monument Ave., P.O. Box 825, Dayton 1, Ohio
5

GENERAL ENGINES CO., 307 Hunter St., Gloucester, N. J.
8—17—18

GREENVILLE MFG. WORKS, 112½ W. 4th St., Greenville, Ohio
A

THE HELTZEL STEEL FORM AND IRON CO., 1750 Thomas Road, Warren, Ohio
A—3—11—14

A. C. HORN CO., INC., 10th St. & 44th Ave., Long Island City 1, N. Y.
5

HYDRO-FORGED STONE ASSOCIATES, INC., 420 Bulkley Bldg., Cleveland 15, Ohio
12—18

IRVINGTON FORM & TANK CORP., 20 Vesey St., New York 7, N. Y.
A—13—18

●**THE KENT MACHINE CO.,** 113 E. Portage Trail, Cuyahoga Falls, Ohio
4—15

THE KIRK & BLUM MFG. CO., 3120 Forrer Ave., Cincinnati 9, Ohio
3—6—9—15

●**LIPPMANN ENGINEERING WORKS,** 4603 W. Mitchell St., Milwaukee 14, Wis.
A

METAL FORMS CORP., 3334 N. Booth St., Milwaukee 12, Wis.
A—3—17—18

MISHCO CORP., 615 SW 2nd Ave., Miami, Fla.
6—11—12—15—17

●**MULTIPLEX MACHINERY CORP.,** Elmore, Ohio
11

●**QUINN WIRE & IRON WORKS,** Boone, Iowa
11—13—14

REARDON INDUSTRIES, INC., 2837 Stanton Ave., Cincinnati 6, Ohio

●**JOSEPH T. RYERSON & SON, INC.,** 2558 W. 16th St., Chicago 80, Ill.
9

SANI-BIN CORP. OF BUFFALO, 338 Scajaquada St., Buffalo 11, N. Y.
1—7

SHERMAN CONCRETE PIPE MACHINERY, INC., P.O. Box 3278, Knoxville 17, Tenn.
13

SPEEDBLOCK, INC., 1144 Union Commerce Bldg., Cleveland 14, Ohio
18

STURTEVANT MILL CO., 102 Clayton St., Boston 22, Mass.
13

SYMONS CLAMP & MFG. CO., 4269 Diversey Ave., Chicago 39, Ill.
6—18

R. K. TYRA CORP., Tyra, Minn.

UNIVERSAL CONCRETE MCHY. CO., INC., 297 S. High St., Columbus 15, Ohio
2—13

WITTEMANN MACHINERY CO., Paynters Rd., Farmingdale, N. J.
A—11

● A dot before name indicates advertiser in this issue. See advertiser index.

DIRECTORY

ZONOLITE COMPANY, 135 S. LaSalle St., Chicago 3, Ill.
6

CONCRETE SPECIALTY MACHINES

1. Chimney & Flue Block
1A. Drain Tile
2. Fence Post
3. Joist & Slab
3A. Ornamental Fence Blocks
4. Pipe, Culvert & Sewer
5. Roof Tile
6. Sill & Lintel
7. Silo Stave
8. Tile & Conduit

•**ANGLO-SCOTTISH TOOL, LTD.,** Team Valley, Gateshead 11, England
5

E. P. BARBER CO., 560 W. Valley Blvd., Bloomington, Calif.
5

•**BESSER MFG. CO.,** Alpena, Mich.
1—2—3—5—6—7—8

CHASE CONCRETE MACHINERY CO., 94 Grandview Ave., Buffalo, 2, N. Y.
1—7—8

COLORCRETE INDUSTRIES, INC., 24th & Ottawa Ave., Holland, Mich.
1—6

COLUMBIA MACHINE WORKS, 107 S. Grand Ave., Vancouver, Wash.
1

•**CONCRETE EQUIPMENT CO.,** Holland, Mich.
8

CONCRETE INDUSTRIES, INC., 15025 Oxnard St., Van Nuys, Calif.
2—5—6

•**CONCRETE MACHINERY CO.,** P.O. Box 2248, Hickory 7, N. C.
1A—3A—4

CONCRETE PIPE MACHINERY CO., 111 S. Grange St., (P.O. Box 17081), Sioux City 2, Iowa
4—8

W. E. DUNN MFG. CO., 550 W. 23rd St., Holland, Mich.
1A—3—5

•**FLEMING MFG. CO.,** 4985 Fyler Ave., St. Louis, Mo.
1—8

GENERAL ENGINES CO., 307 Hunter St., Gloucester, N. J.
1—6

HOUSTON CONCRETE MACHINERY, 6600 Washington Ave., Houston 7, Texas
4

•**THE KENT MACHINE CO.,** 113 E. Portage Trail, Cuyahoga Falls, Ohio
1—6

THE KIRK & BLUM MFG. CO., 3120 Forrer, Cincinnati 9, Ohio
2—3—6

•**LITH-I-BAR CO.,** Sentinal Bldg., Holland, Mich.
3

MARTIN IRON WORKS, 1222 E. 28th St., Los Angeles, Calif.
4

THE MILES MFG. CO., 545-7 Hupp Ave., Jackson, Mich.
1

LESLIE C. MILLER SUPPLY INC., P. O. Box 7, Bedford, Ohio
8

•**MULTIPLEX MACHINERY CORP.,** Elmore, Ohio
1—7—8

THE GENE OLSEN CORP., 401 Grace St., Adrian, Mich.
1—4—8

•**QUINN WIRE & IRON WORKS,** Boone, Iowa
4

SHERMAN CONCRETE PIPE MACHINERY, INC., P.O. Box 3278, Knoxville 17, Tenn.
4

•**STEARNS MFG. CO., INC.,** 600 E. Beecher St., Adrian, Mich.
1—2—3—4—5—6—7—8

R. K. TYRA CORP., Tyra, Minn.

UNIVERSAL CONCRETE MCHY. CO., INC., 297 S. High St., Columbus 15, Ohio
4

WITTEMANN MACHINERY CO., Paynters Rd., Farmingdale, N. J.
1

CONCRETE WATERPROOFING AND DAMPPROOFING

AMERICAN FLURESIT CO., INC., 4011 Red Bank Rd., Cincinnati 27, Ohio

AUTOLENE LUBRICANTS CO., PROTEX DIV., 1331 W. Evans Ave., Denver 9, Colo.

THE BARRETT DIV., ALLIED CHEMICAL & DYE CORP., 40 Rector St., New York 6, N. Y.

BLUE RIDGE TALC CO., INC., P.O. Box 7, Henry, Va.

THE CARTER-WATERS CORP., 2440 Pennway, Kansas City 8, Mo.

COLORCRETE INDUSTRIES, INC., 24th & Ottawa Ave., Holland, Mich.

DEWEY AND ALMY CHEMICAL CO., 62 Whittemore Ave., Cambridge 40, Mass.

DOW CORNING CORP., Midland, Mich.

HOPPER PRODUCTS, INC., 12 E. 41st St., New York 17, N. Y.

A. C. HORN CO., INC., 10th St. & 44th Ave., Long Island City 1, N. Y.

HYDRO-FORGED STONE ASSOCIATES, INC., 420 Bulkley Bldg., Cleveland 15, Ohio

HYDROZO PRODUCTS, INC., 3230 University Ave., Madison, Wis.

JINKINS LABORATORY, 3620 W. Sixth St., Los Angeles 5, Cal.

KAY-TITE CO., 10 White St., West Orange, N. J.

KOPPERS CO., INC., Koppers Bldg., Pittsburgh 19, Pa.

•**LIPPMANN ENGINEERING WORKS,** 4603 W. Mitchell St., Milwaukee 14, Wis.

•**THE MASTER BUILDERS CO.,** 7016 Euclid Ave., Cleveland 3, Ohio

E. L. MOORE CO., 1931 Oakwood St., Pasadena 7, Calif.

NOPCO CHEMICAL CO., Dept RP, Harrison, N. J.

PHILADELPHIA QUARTZ CO., 6th & Chestnut Streets, Philadelphia 6, Pa.

THE REARDON CO., 7501 Page Ave., St. Louis 14, Mo.

SIKA CHEMICAL CORP., 35 Gregory Ave., Passaic, N. J.

L. SONNEBORN SONS, INC., 300 Fourth Ave., New York 10, N. Y.

SPRAY-O-BOND COMPANY, 2225 N. Humboldt Ave., Milwaukee 12, Wis.

TAMMS INDUSTRIES, INC., 228 No. LaSalle St., Chicago 1, Ill.

CONDUIT, Electrical

•**GENERAL ELECTRIC CO.,** 1 River Road, Schenectady 5, N. Y.

JOHNS-MANVILLE, 22 E. 40th St., New York 16, N. Y.

•**LIPPMANN ENGINEERING WORKS,** 4603 W. Mitchell St., Milwaukee 14, Wis.

REPUBLIC STEEL CORP., Republic Bldg., Cleveland 1, Ohio

CONTROL SYSTEMS

1. Draft
2. Pressure
3. Temperature

•**BAILEY METER CO.,** 1050 Ivanhoe Road, Cleveland 10, Ohio
1—2—3

THE BRISTOL CO., Waterbury 20, Conn.
1—2—3

•**GENERAL ELECTRIC CO.,** 1 River Rd., Schenectady 5, N. Y.
2—3

THE HAYS CORP., East 8th St., Michigan City, Ind.
1—2

LEEDS & NORTHRUP CO., 4970 Stenton Ave., Philadelphia 44, Pa.
1—2—3

•**LIPPMANN ENGINEERING WORKS,** 4603 W. Mitchell St., Milwaukee 14, Wis.
3—4—5—6—8—9—10—11

MANNING, MAXWELL & MOORE, INC., 250 E. Main, Stratford, Conn.
2—3

MINNEAPOLIS REGULATOR CO., BROWN INSTRUMENTS DIV., Wayne & Windrim Aves., Philadelphia 44, Pa.
1—2—3

C. A. NORGREN CO., 3400 S. Elati St., Englewood, Colo.
2

PYROMETER INSTRUMENT CO., INC., 92 Portland Ave., Bergenfield, N. J.
3

STAPLES & PFEIFFER, 528 Bryant St., San Francisco 7, Calif.
2

WHEELCO INSTRUMENTS CO., 847 W. Harrison St., Chicago 7, Ill.
3

CONTROLS, Bin and Tank Level

•**THE BIN-DICATOR CO.,** 13946 Kercheval, Detroit 15, Mich.

•**DIAMOND IRON WORKS, INC.,** 1728 2nd St., N., Minneapolis 11, Minn.

•**GENERAL ELECTRIC CO.,** 1 River Rd., Schenectady 5, N. Y.

THE HAYS CORP., East 8th St., Michigan City, Ind.

HELTZEL STEEL FORM & IRON CO., 1750 Thomas Rd., Warren, Ohio

•**THE C. S. JOHNSON CO.,** P.O. Box 71, Champaign, Ill.

MINNEAPOLIS - HONEYWELL REGULATOR CO., BROWN INSTRUMENTS DIV., Wayne & Roberts Aves., Philadelphia 44, Pa.

MOSHER ELECTRONIC CONTROLS, 25 Boston Post Rd., Larchmont, N. Y.

PHOTOSWITCH, INC., 77 Broadway 42, Mass.

STEPHENS-ADAMSON MFG. CO., 7 Ridgeway Ave., Aurora, Ill.

CONVERTERS, Electric

•**ALLIS-CHALMERS MFG. CO.,** 975 So. 70th St., Milwaukee 1, Wis.

B. F. M. INDUSTRIES, INC., 2124 Mill Ave., Brooklyn 34, N. Y.

•**GENERAL ELECTRIC CO.,** 1 River Road, Schenectady 5, N. Y.

I-T-E CIRCUIT BREAKER CO., 19th and Hamilton St., Philadelphia 30, Pa.

TRAYLOR ENGINEERING & MFG. CO., Allentown, Pa.

CONVEYOR BELT TRIPPERS

THE C. O. BARTLETT AND SNOW CO., 6200 Harvard Ave., Cleveland 5, Ohio

BODINSON MFG. CO., 2401 Bayshore Blvd., San Francisco 24, Calif.

•**CHAIN BELT CO.,** 1600 W. Bruce St., Milwaukee 4, Wis.

•**CONTINENTAL GIN CO.,** 4500 5th Ave. S., Birmingham, Ala.

THE CONVEYOR CO., 3260 East Slauson Ave., Los Angeles 11, Calif.

CONVEYOR ENGINEERING & SUPPLIES CORP., Hobart Pl. D.L.W.R.R., Clifton, N. J.

•**DIAMOND IRON WORKS, INC.,** 1728 2nd St., N., Minneapolis 11, Minn.

•**THE J. B. EHRSAM & SONS MFG. CO.,** Enterprise, Kans.

•**A. B. FARQUHAR CO.,** Dept. 28, 142 N. Duke St., York, Pa.

THE GOODYEAR TIRE & RUBBER CO., INC., 1144 E. Market St., Akron 16, Ohio

GREENVILLE MFG. WORKS, 112½ W. 4th St., Greenville, Ohio

GEORGE HAISS MFG. CO., Park Ave. & 143rd St., New York 51, N. Y.

•**ROBINS CONVEYOR DIV., HEWITT-ROBINS INC.,** 270 Passaic Ave., Passaic, N. J.

•**IOWA MFG. CO.,** 916 16th St. N. E., Cedar Rapids, Iowa

THE JEFFREY MFG. CO., 935 N. 4th St., Columbus 16, Ohio

•**LINK-BELT CO.,** 300 W. Pershing Road, Chicago 9, Ill.

E. F. MARSH ENG. CO., 4324 W. Clayton Ave., St. Louis 10, Mo.

NOBLE CO., 1860 Seventh St., Oakland 20, Calif.

•**W. A. RIDDELL CORP.,** Bucyrus, Ohio

STEPHENS-ADAMSON MFG. CO., 7 Ridgeway Ave., Aurora, Ill.

•**UNIVERSAL ENGINEERING CORP.,** 625 C Ave. N. W., Cedar Rapids, Iowa

WIS. FOUNDRY & MACHINE CO., 623 E. Main St., Madison, Wis.

CONVEYOR IDLERS, Belt

ACME ROAD MACHINERY CO., East Main St., Frankfort, N. Y.

•**BARBER-GREENE CO.,** 631 W. Park Ave., Aurora, Ill.

THE C. O. BARTLETT AND SNOW CO., 6200 Harvard Ave., Cleveland 5, Ohio

BODINSON MFG. CO., 2401 Bayshore Blvd., San Francisco 24, Calif.

BONDED SCALE & MACHINE CO., 41 Bellview Ave., Columbus 7, Ohio

•**CHAIN BELT CO.,** 1600 W. Bruce St., Milwaukee 4, Wis.

•**CONTINENTAL GIN CO.,** 4500 5th Ave. S., Birmingham, Ala.

THE CONVEYOR CO., 3260 East Slauson Ave., Los Angeles 11, Calif.

CONVEYOR ENGINEERING & SUPPLIES CORP., Hobart Pl. D.L.W.R.R., Clifton, N. J.

DIAMOND IRON WORKS, INC., 1728 2nd St. No., Minneapolis 11, Minn.

R. & J. DICK CO. INC., P.O. Box 388, Passaic, N. J.

•**THE J. B. EHRSAM & SONS MFG. CO.,** Enterprise, Kans.

•**A. B. FARQUHAR CO.,** 142 N. Duke St., Dept. 28, York, Pa.

GREENVILLE MFG. WORKS, 112½ W. 4th St., Greenville, Ohio

GEORGE HAISS MFG. CO., Park Ave. & 143rd St., New York 51, N. Y.

THE HELTZEL STEEL FORM & IRON CO., 1750 Thomas St., Warren, Ohio

•**ROBINS CONVEYORS DIV., HEWITT-ROBINS INC.,** 270 Passaic Ave., Passaic, N. J.

•**IOWA MFG. CO.,** 916 16th St. N. E., Cedar Rapids, Iowa

THE JEFFREY MFG. CO., 935 N. 4th St., Columbus 16, Ohio

•**JOY MANUFACTURING CO.,** Henry W. Oliver Bldg., Pittsburgh 22, Pa.

•**KENNEDY VAN SAUN MFG. & ENG. CORP.,** 2 Park Ave., New York 16, N. Y.

• A dot before name indicates advertiser in this issue. See advertiser index.

DIRECTORY

FRANK A. KREMSER & SONS, INC., 3435-45 N. 5th St., Philadelphia 40, Pa.

●**LINK-BELT CO.**, 300 W. Pershing Road, Chicago 9, Ill.

E. F. MARSH ENG. CO., 4324 W. Clayton, St. Louis 10, Mo.

McNALLY PITTSBURGH MFG. CORP., Pittsburg, Kans.

●**PETTIBONE MULLIKEN CORP., IMPACT MASTER DIV.**, 4700 W. Division, Chicago 51, Ill.

●**PIONEER ENG. WORKS, INC.**, 1515 Central Ave., Minneapolis 13, Minn.

PYOTT FOUNDRY & MACHINE CO., 328 No. Sangamon St., Chicago 7, Ill.

●**SMITH ENGINEERING WORKS**, 532 E. Capitol Dr., Milwaukee 12, Wis.

SPROUT, WALDRON & CO., INC., Muncy, Pa.

STEPHENS-ADAMSON MFG. CO., 7 Ridgeway Ave., Aurora, Ill.

TRANSALL INC., 109 N. 11th St., Birmingham 4, Ala.

TRIANGLE ENGINEERING CO., 2848 W. 26th St., Chicago 23, Ill.

TROWBRIDGE CONVEYOR CO., 851 Van Houten Ave., Clifton, N. J.

●**UNIVERSAL ENGINEERING CORP.**, 625 C Ave. N. W., Cedar Rapids, Iowa

WEBSTER MFG. INC., Tiffin 16, Ohio

WIS. FOUNDRY & MACHINE CO., 623 E. Main St., Madison, Wis.

●**YUBA MFG. CO.**, 351 California St., San Francisco 4, Calif.

CONVEYORS, Materials Handling

1. Aeration
2. Air
3. Apron
4. Belt
5. Belt, Portable
6. Drag
7. Overhead Bridge
8. Pan
9. Screw
10. Vibrating
11. Weight Recording

ACME ROAD MACHINERY CO., East Main St., Frankfort, N. Y.
4

ALLIED WELDING & MFG. CO. INC., 49 Lorna Doone Blvd., Orlando, Fla.
4—5

AJAX FLEXIBLE COUPLING CO., INC., Westfield, N. Y.
10

AMERICAN CONVEYOR CO., 1117 W. Adams St., Chicago 7, Ill.
4—5—6—9—10

ANCHOR CONCRETE MACHINERY CO., 1191 Fairview Ave., Columbus 12, Ohio
4—5

ANDERSON ENGINEERING CO., 237 Bent St., Cambridge 41, Mass.
4

●**AUSTIN-WESTERN CO.**, 601 N. Farnsworth Ave., Aurora, Ill.
4—5

●**BARBER-GREENE CO.**, 631 W. Park Ave., Aurora, Ill.
3—4—5

THE C. O. BARTLETT AND SNOW CO., 6200 Harvard Ave., Cleveland 5, Ohio
3—4—5—6—8—9

●**BAUGHMAN MFG. CO., INC.**, 1000 Shipman Rd., Jerseyville, Ill.
4—5—6—9

BEAUMONT BIRCH CO., 1512 Race St., Philadelphia 2, Pa.
2—3—4—6—9

BODINSON MFG. CO., 2401 Bayshore Blvd., San Francisco 24, Calif.
4

BONDED SCALE & MACHINE CO., 41 Bellview Ave., Columbus 7, Ohio
4—5—6

BOSTON WOVEN HOSE & RUBBER CO., P. O. Box 1071, Boston 3, Mass.
4

BROOKS EQUIPMENT & MFG. CO., 408-10 Davenport Road, Knoxville 3, Tenn.
5

BUILDERS-PROVIDENCE, INC., 345 Harris Ave., Providence 1, R. I.
11

THE BURCH CORP., Crestline, Ohio
4

●**BUTLER BIN CO.**, Box 407, Waukesha, Wis.
4—9

CARLYLE RUBBER CO., INC., 62-66 Park Pl., New York 7, N. Y.
4—5

●**CHAIN BELT CO.**, 1600 W. Bruce St., Milwaukee 4, Wis.
3—4—6—8

CHICAGO STEEL FOUNDRY CO., 3720 So. Kedzie Ave., Chicago 32, Ill.
4—9

THE CLEVELAND CRANE & ENGINEERING CO., 5866 E. 289th St., Wickliffe, Ohio
7

CLYDE IRON WORKS, INC., P.O. Box 370, Duluth 1, Minn.
7

●**THE COLORADO FUEL & IRON CORP.**, Continental Oil Bldg., Denver 2, Colo.
4

COLORADO IRON WORKS CO., 1624 17th St., Denver 2, Colo.
9

CONCRETE TRANSPORT MIXER CO., 4985 Fyler Ave., St. Louis 9, Mo.
4—5—9

●**CONTINENTAL GIN CO.**, 4500 5th Ave. S., Birmingham, Ala.
3—4—6—8—9—10

THE CONVEYOR CO., 3260 East Slauson Ave., Los Angeles 11, Calif.
3—4—6—8—9

CONVEYOR ENGINEERING & SUPPLIES CORP., Hobart Pl. D.L.W.R.R., Clifton, N. J.
1—3—4—5—6
7—8—9—10

C. R. DANIELS, INC., 4900 Wetheredsville Rd., Baltimore 16, Md.
4

ROY DARDEN INDUSTRIES, INC., P. O. Box 95, North Side Branch, Atlanta 3, Ga.
6

THE DAY COMPANY, 810 Third Ave., N. E., Minneapolis 13, Minn.
2

●**DENVER EQUIPMENT CO.**, 1410 Seventeenth St., Denver 17, Colo.
3—4

DIAMOND IRON WORKS, INC., 1728 2nd St., No., Minneapolis 11, Minn.
3—4—5—6—8

R. & J. DICK CO., INC., P.O. Box 388, Passaic, N. J.

DOWNS CRANE & HOIST CO., 540 W. Vernon Ave., Los Angeles 37, Calif.
7

EAGLE CRUSHER CO., INC., 900 Harding Way E., Galion, Ohio
4

●**THE J. B. EHRSAM & SONS MFG. CO.**, Enterprise, Kans.
3—4—6—7—8—9

THE FAFNIR BEARING CO., 37 Booth St., New Britain, Conn.
4

A. B. FARQUHAR CO., 142 N. Duke St., Dept. 28, York, Pa.
4—5—6

●**FLEMING MFG. CO.**, 4985 Fyler Ave., St. Louis 9, Mo.
4—5—9

●**FULLER COMPANY**, Fuller Bldg., Catasauqua, Pa.
2

GAR-BRO MFG. CO., 2416 E. 16th St., Los Angeles 21, Calif.
4

GENERAL ENGINES CO., 307 Hunter St., Gloucester, N. J.
4

F. C. GEORGE MACHINE CO., INC., 100 S. Wesetmoreland Dr., Orlando, Fla.
4

GODFREY CONVEYOR CO., 13th & Wolf Ave., Elkhart, Ind.
3—4—5—6

GOODALL RUBBER CO., Whitehead Road, Trenton 4, N. J.
4

GREENVILLE MFG. WORKS, Greenville, Ohio
3—4—9

●**THE GOODYEAR TIRE & RUBBER CO., INC.**, 1144 E. Market St., Akron 16, Ohio
4—5

GRUENDLER CRUSHER & PULVERIZER CO., 2920 N. Market St., St. Louis 6, Mo.
3—4—5—6

GEORGE HAISS MFG. CO., Park Ave. & 143rd St., New York 51, N. Y.
4—5—6

●**HARDINGE CO., INC.**, 240 Arch St., York, Pa.
2—9

JAMES C. HEINTZ & CO., INC. 3738 W. 143 St., Cleveland 11, Ohio
4

THE HELTZEL STEEL FORM AND IRON CO., 1750 Thomas Road, Warren, Ohio
3—4—9—10

●**HENDRICK MFG. CO.**, 47 Dundaff St., Carbondale, Pa.
3

HERCULES STEEL PRODUCTS CORP., Sherman St., Galion, Ohio
5

●**ROBINS CONVEYORS DIV., HEWITT-ROBINS INC.**, 270 Passaic Ave., Passaic, N. J.
3—4—5—8—10

HONAN-CRANE CORP., Lebanon, Indiana

●**IOWA MFG. CO.**, 916 16th St., N. E., Cedar Rapids, Iowa
4—5

THE JEFFREY MFG. CO., 935 N. 4th St., Columbus 16, Ohio
4—6—8—9—10—11

JOHNSON & HOEHLER, INC., P.O. Box 102, Lansdowne, Pa.

●**JOY MANUFACTURING CO.**, Henry W. Oliver Bldg., Pittsburgh 22, Pa.
4

●**KENNEDY VAN SAUN MFG. & ENG. CORP.**, 2 Park Ave., New York 16, N. Y.
2—3—4—5—6—8—9

KENSINGTON STEEL CO., 505 Kensington St., Chicago 28, Ill.
3—8

●**THE KENT MACHINE CO.**, 113 E. Portage Trail, Cuyahoga Falls, Ohio
4

THE KIRK & BLUM MFG. CO., 3120 Forrer, Cincinnati 9, Ohio
2

KORB-PETTIT WIRE FABRICS & IRON WORKS, INC., 1505-15 N. Mascher St., Philadelphia 22, Pa.
3—4

FRANK A. KREMSER & SONS, INC., 3435-45 N. 5th St., Philadelphia 40, Pa.
3—4—5—6

LANDIS STEEL CO., 116 W. A St., Picher, Okla.
4

●**LINK-BELT CO.**, 300 W. Pershing Road, Chicago 9, Ill.
1—3—4—5—7—8—9—10—11

LIPPMANN ENGINEERING WORKS, 4603 W. Mitchell St., Milwaukee 14, Wis.
3—4—5—9—11

MANGANESE STEEL FORGE CO., Richmond St., & Castor Ave., Philadelphia 34, Pa.
3

E. F. MARSH ENG. CO., 4324 W. Clayton Ave., St. Louis 10, Mo.
3—4—5

●**MERRICK SCALE MFG. CO.**, 180 Autumn St., Passaic, N. J.
11

LESLIE C. MILLER SUPPLY INC., P. O. Box 7, Bedford, Ohio
4

MULTIPLEX MACHINERY CORP., Elmore, Ohio
4

●**McLANAHAN AND STONE CORP.**, Hollidaysburg, Pa.
3

McNALLY-PITTSBURG MFG. CORP., Pittsburg, Kans.
3—4—6—7—8—9—10

NICHOLS ENG. & RESEARCH CORP., 70 Pine St., New York 5, N. Y.
11

NOBLE CO., 1860 Seventh St., Oakland 20, Calif.
4—9

●**PETTIBONE MULLIKEN CORP., IMPACT MASTER DIV.**, 4710 W. Division St., Chicago 51, Ill.
3—4

●**PIONEER ENG. WORKS, INC.**, 1515 Central Ave., Minneapolis 13, Minn.
3—4—5

POSEY IRON WORKS, INC., INDUSTRIAL HEATING DIVN., 560 S. Prince St., Lancaster, Pa.
2—9

●**PRASCHAK MACHINE CO.**, Marshfield, Wis.
4

●**PRODUCTIVE EQUIPMENT CORP.**, 2926 W. Lake St., Chicago 12, Ill.
10

PULVERIZING MACHINERY CO., 57 Chatham Rd., Summit, N. J.
2

●**REPUBLIC RUBBER DIV.**, Lee Rubber & Tire Corp., Albert St., Youngstown 1, Ohio
4

●**W. A. RIDDELL CORP.**, Bucyrus, Ohio
4

WM. E. ROBINSON & CO., 3633 Spring Garden St., Phila. 4, Pa.

ROBINSON AIR-ACTIVATED CONVEYOR SYSTEMS, 205 E. 42nd St., New York 17, N. Y.
2

ROGERS IRON WORKS CO., 11th & Pearl Sts., Joplin, Mo.
3—4—5—6—8

SALEM TOOL CO., 700 S. Ellsworth St., Salem, Ohio
9

SAUERMAN BROS., INC., 530 S. Clinton St., Chicago 7, Ill.
2

SCANDINAVIA BELTING CO., 250 Central Ave., Newark 1, N. J.
4

SIMPLICITY ENGINEERING CO., Durand, Mich.

SINTERING MACHINERY CORP., Netcong, N. J.
11

●**F. L. SMIDTH & CO.**, 11 W. 42nd St., New York 18, N. Y.
10

●**SMITH ENGINEERING WORKS**, 532 E. Capitol Dr., Milwaukee 12, Wis.
3—4—5

THE SPENCER TURBINE CO., 486 New Park Ave., Hartford 6, Conn.
2

SPROUT, WALDRON & CO., INC., Muncy, Pa.
4—9

STANDARD CONVEYOR COMPANY, 315 N. W. Second, North St. Paul, Minn.
3—4

● A dot before name indicates advertiser in this issue. See advertiser index.

DIRECTORY

STEPHENS-ADAMSON MFG. CO., 7 Ridgeway Ave., Aurora, Ill.
3—4—6—8—9—10

STRAUB MANUFACTURING CO., 456 Chestnut St., Oakland, Calif.

STURTEVANT MILL CO., 102 Clayton St., Boston 22, Mass.
9

•**SYNTRON CO.,** 450 Lexington Ave., Homer City, Pa.
10

•**TAYLOR - WHARTON IRON & STEEL CO.,** High Bridge, N. J.
3

TRANSALL, INC., 109 N. 11th St., Birmingham 4, Ala.
4

TRAYLOR ENGINEERING & MFG. CO., Allentown, Pa.
3

TRIANGLE ENGINEERING CO., 2848 W. 26th St., Chicago 23, Ill.
3—4—5—6

TROWBRIDGE CONVEYOR CO., 851 Van Houten Ave., Clifton, N. J.
3—4—5—6—10—11

R. K. TYRA CORP., Tyra, Minn.
5

UNITED IRON WORKS CO., 108 No. Locust, Pittsburg, Kans.
3—4—6—8—9

•**UNIVERSAL ENGINEERING CORP.,** 625 C Ave., N. W., Cedar Rapids, Iowa
3—4—5

UNIVERSAL ROAD MACHINERY CO., 27 Emerick St., Kingston, N. Y.
4

THE WELLMAN ENGINEERING CO., 7000 Central Ave., Cleveland 5, Ohio
7

WICKWIRE SPENCER STEEL DIV., THE COLORADO FUEL & IRON CORP., 500 Fifth Ave., New York 18, N. Y.
4

•**WILLARD CONCRETE MACHINERY CO., LTD.,** 2906 Imperial Highway, Lynwood, Calif.
5

•**WILLIAMS PATENT CRUSHER & PULV. CO.,** 800 St. Louis Ave., St. Louis 6, Mo.
2—4—9

WIS. FOUNDRY & MACHINE CO., 623 E. Main St., Madison, Wis.
3—4—5—6—9

WITTEMANN MACHINERY CO., Paynters Road, Farmingdale, N. J.
4

•**YUBA MFG. CO.,** 351 California St., San Francisco 4, Calif.
4

COOLERS, Bulk Cement

THE BONNOT CO., 722 Mulberry S.E., Canton 2, Ohio

THE CONVEYOR CO., 3260 East Slauson Ave., Los Angeles 11, Calif.

•**FULLER COMPANY,** Fuller Bldg., Catasauqua, Pa.

HARDINGE CO., INC., 240 Arch St., York, Pa.

•**KENNEDY VAN SAUN MFG. & ENG. CORP.,** 2 Park Ave., New York 16, N. Y.

THE NORTHERN BLOWER CO., 6408 Barberton Ave., Cleveland 2, Ohio

•**F. L. SMIDTH & CO.,** 11 W. 42nd St., New York 18, N. Y.

•**TRAYLOR ENGINEERING & MFG. CO.,** Allentown, Pa.

•**VULCAN IRON WORKS,** 730 S. Main St., Wilkes-Barre, Pa.

WEBBER EQUIPMENT CORP., 10 E. 44th St., New York 17, N. Y.

WESTERN PRECIPITATION CORP., 1016 W. Ninth St., Los Angeles 15, Calif.

COOLERS, Cement Clinker (see Clinker Coolers)

CORRECTING, BASINS, Slurry

•**F. L. SMIDTH & CO.,** 11 W. 42nd St., New York 18, N. Y.

MANITOWOC ENGINEERING WORKS, Manitowoc, Wis.

COUPLINGS, Hose (see Hose Fittings)

COUPLINGS, Pipe

BETHLEHEM STEEL CO., 701 E. Third St., Bethlehem, Pa.

GREENVILLE MFG. WORKS, 112½ W. 4th St., Greenville, Ohio

JOHNS-MANVILLE, 22 E. 40th St., New York 16, N. Y.

NAYLOR PIPE CO., 1237 E. 92nd St., Chicago 19, Ill.

VICTAULIC CO. OF AMERICA, P.O. Box 509, Elizabeth, N. J.

WALWORTH CO., 60 East 42nd St., New York 17, N. Y.

COUPLINGS, Shaft, Flexible Shaft (see Drives)

CRANE, Boom, Cable Stabilizer

CLYDE IRON WORK, INC., P.O. Box 370, Duluth 1, Minn.

M. P. McCAFFREY, INC., 2121 East 25th St., Los Angeles 11, Calif.

•**SCHIELD BATAM CO.,** 216 Park St., Waverly, Iowa

CRANES, Crawler

1. Diesel
2. Electric
3. Gasoline

•**AMERICAN HOIST & DERRICK CO.,** 63 S. Robert St., St. Paul 1, Minn.
1—2—3

•**AUSTIN-WESTERN CO.,** Aurora, Ill.
1—3

BAY CITY SHOVELS, INC., Bay City, Mich.
1—2—3

THE BROWNING CRANE & SHOVEL CO., 16226 Waterloo Rd., Cleveland 10, Ohio
1—2—3

•**BUCYRUS-ERIE CO.,** South Milwaukee, Wis.
1—2—3

THE BYERS MACHINE CO., Lock Box 390, Ravenna, Ohio
1—3

ELECTRO LIFT, INC., 30 Church St., New York 7, N. Y.
2

ELWELL-PARKER ELECTRIC CO., 4058 St. Clair Ave., Cleveland 14, Ohio
2

THE HANSON CLUTCH & MACHINERY CO., Wall & Miami Sts., Tiffin 15, Ohio
1—3

•**HARNISCHFEGER CORP.,** 4400 W. National Ave., Milwaukee 14, Wis.
1—2—3

HYSTER CO., 2918 N.E. Clackamas, Portland 8, Ore.
3

INSLEY MFG. CORP., 801 N. Olney, Indianapolis 1, Ind.
1—2—3

KEYSTONE DRILLER CO., 8th Ave., Beaver Falls, Pa.
1—2—3

•**KOEHRING CO.,** 3026 W. Concordia Ave., Milwaukee 16, Wis.
1—2—3

LIMA - HAMILTON DIV., OF BALDWIN - LIMA - HAMILTON CORP., South Main St., Lima, Ohio
1—2—3

LINK-BELT SPEEDER CORP., 1201 Sixth St. S. W., Cedar Rapids, Iowa
1—2—3

MANITOWOC ENGINEERING WORKS, Manitowoc, Wis.
1—2—3

MARION POWER SHOVEL CO., 617 W. Center St., Marion, Ohio
1—2—3

MICHIGAN POWER SHOVEL CO., 250 Miller Road, Benton Harbor, Mich.
1—2—3

•**NORTHWEST ENGINEERING CO.,** 135 S. LaSalle St., Chicago 3, Ill.
1—2—3

ORTON CRANE & SHOVEL CO., 608 S. Dearborn St., Chicago 5, Ill.
1—2—3

•**THE OSGOOD CO.,** Marion, Ohio
1—2—3

SHEPPARD DIESELS, Philadelphia St., Hanover, Pa.
1

SHEPARD NILES CRANE & HOIST CORP., Schuyler Ave., Montour Falls, N. Y.
2

SILENT HOIST & CRANE CO., 879 63rd St., Brooklyn 20, N. Y.
1—3

•**THE THEW SHOVEL CO.,** 1000 E. 28th St., Lorain, Ohio
1—2—3

•**UNIT CRANE & SHOVEL CORP.,** 6411 W. Burnham St., Milwaukee 14, Wis.
1—3

WAYNE CRANE DIV., AMERICAN STEEL DREDGE CO., INC., 2511 Taylor St., Fort Wayne, Ind.
1—3

CRANES, Locomotive

1. Diesel
2. Electric
3. Gasoline
4. Electric Generator

•**AMERICAN HOIST & DERRICK CO.,** 63 S. Robert St., St. Paul 1, Minn.
1—2—3—4

BAKER INDUSTRIAL TRUCK DIV., THE BAKER-RAULANG CO., 1250 W. 80th St., Cleveland 2, Ohio
2

THE BROWNING CRANE & SHOVEL CO., 16226 Waterloo Road, Cleveland 10, Ohio
1—2—3

•**BUCYRUS-ERIE CO.,** South Milwaukee, Wis.
1—2—3

CLYDE IRON WORKS, INC., P. O. Box 370, Duluth 1, Minn.
1—2—3—4

HYSTER CO., 2902 N. E. Clackamas, Portland 8, Ore.
3

INSLEY MFG. CORP., 801 N. Olney, Indianapolis 1, Ind.
1

KEYSTONE DRILLER CO., 8th Ave., Beaver Falls, Pa.
1—2—3

MAINE STEEL INC., 169 Front St., South Portland, Me.

ORTON CRANE & SHOVEL CO., 608 S. Dearborn St., Chicago 5, Ill.
1—2—3—4—5

SHEPARD NILES CRANE & HOIST CORP., Schuyler Ave., Montour Falls, N. Y.
2

SILENT HOIST & CRANE CO., 879 63rd St., Brooklyn 20, N. Y.
1—3

CRANES, Truck-Mounted

•**AMERICAN HOIST & DERRICK CO.,** 63 S. Robert St., St. Paul 1, Minn.

ASHLAND VAULT INC., 500-518 Virginia Ave., Ashland 4, Ohio

BAY CITY SHOVELS, INC., Bay City, Mich.

THE BROWNING CRANE & SHOVEL CO., 16226 Waterloo Road, Cleveland 10, Ohio

•**BUCYRUS-ERIE CO.,** South Milwaukee, Wis.

THE BYERS MACHINE CO., Lock Box 390, Ravenna, Ohio

DEMPSTER BROTHERS, INC., Springdale St., Knoxville 17, Tenn.

GAR WOOD INDUSTRIES, INC., Wayne Div., Wayne, Mich.

THE HANSON CLUTCH & MACHINERY CO., Wall & Miami Sts., Tiffin 15, Ohio

•**HARNISCHFEGER CORP.,** 4400 W. National Ave., Milwaukee 14, Wis.

HYSTER CO., 2902 N. E. Clackamas, Portland 8, Ore.

INSLEY MFG. CORP., 801 N. Olney, Indianapolis 1, Ind.

•**KOEHRING CO.,** 3026 W. Concordia Ave., Milwaukee 16, Wis.

LIMA - HAMILTON DIV., OF BALDWIN - LIMA - HAMILTON CORP., South Main St., Lima, Ohio

LINK-BELT SPEEDER CORP., 1201 Sixth St. S. W., Cedar Rapids, Iowa

MICHIGAN POWER SHOVEL CO., 250 Miller Road, Benton Harbor, Mich.

MIXERMOBILE MANUFACTURERS, 6855 N. E. Halsey St., P.O. Box 5108, Portland 16, Oregon

•**NORTHWEST ENGINEERING CO.,** 135 S. LaSalle St., Chicago 3, Ill.

ORTON CRANE & SHOVEL CO., 608 S. Dearborn St., Chicago 5, Ill.

•**THE OSGOOD CO.,** Marion, Ohio

•**"QUICK-WAY" TRUCK SHOVEL CO.,** 2401 E. 40th Ave., Denver 5, Colo.

•**SCHIELD BANTAM CO.,** 216 Park St., Waverly, Iowa

SHEPARD NILES CRANE & HOIST CORP., Schuyler Ave., Montour Falls, N. Y.

SILENT HOIST & CRANE CO., 879 63rd St., Brooklyn 20, N. Y.

•**THE THEW SHOVEL CO.,** 1000 E. 28th St., Lorain, Ohio

•**UNIT CRANE & SHOVEL CORP.,** 6411 W. Burnham St., Milwaukee 14, Wis.

WAYNE CRANE DIV., AMERICAN STEEL DREDGE CO., INC., 2511 Taylor St., Fort Wayne, Ind.

CRANES, Hammer Head, Ship, etc.

DRAVO CORPORATION, Neville Island, Pittsburgh 25, Pa.

ORTON CRANE & SHOVEL CO., 608 S. Dearborn St., Chicago 5, Ill.

SHEPARD NILES CRANE & HOIST CORP., Schuyler Ave., Montour Falls, N. Y.

THE WELLMAN ENGINEERING CO., 7000 Central Ave., Cleveland 4, Ohio

CRIMPERS, BLASTING CAP (see Blasting Supplies)

• A dot before name indicates advertiser in this issue. See advertiser index.

DIRECTORY

CRUSHERS

1. Gyratory
2. Hammer
3. Impact
4. Jaw
5. Laboratory
6. Ring-Roll
7. Roll

ABBE ENGINEERING CO., 50 Church St., New York 7, N. Y.
5—6

ACME ROAD MACHINERY CO., East Main St., Frankfort, N. Y.
2—3—4—7

•**AMERICAN PULVERIZER CO.,** 1249 Macklind Ave., St. Louis 10, Mo.
2—5

•**ALLIS-CHALMERS MFG. CO.,** 975 So. 70th St., Milwaukee 1, Wis
1—2—3—4—5—7

•**AUSTIN-WESTERN CO.,** 601 N. Farnsworth Ave., Aurora, Ill.
4—7

THE C. O. BARTLETT AND SNOW CO., 6200 Harvard Ave., Cleveland 5, Ohio
2—7

BIRDSBORO STEEL FOUNDRY & MACHINE CO., Birdsboro, Pa.
4—5—7

BONDED SCALE & MACHINE CO., 41 Bellview Ave., Columbus 7, Ohio
7

THE BONNOT CO., 722 Mulberry S.E., Canton 2, Ohio
2—7

BROOKS EQUIPMENT & MFG. CO., 408-10 Davenport Road, Knoxville 3, Tenn.
2—4

•**DENVER EQUIPMENT CO.,** 1410 Seventeenth St., Denver 17, Colo.
4—7

•**DIAMOND IRON WORKS, INC.,** 1728 2nd St. No., Minneapolis 11, Minn.
2—4—7

EAGLE CRUSHER CO., INC., 900 Harding Way E., Galion, Ohio
2—3—4

•**THE J. B. EHRSAM & SONS MFG. CO.,** Enterprise, Kans.
4

FARREL-BACON, Ansonia, Conn.
4

GILSON BROTHERS CO., Fredonia, Wis.
2

GREENVILLE MFG. WORKS, 1121½ W. 4th St., Greenville, Ohio
1

•**GRUENDLER CRUSHER & PULVERIZER CO.,** 2920 N. Market St., St. Louis 6, Mo.
2—3—4—5—6—7

•**HAMMERMILLS, INC., DIV. OF PETTIBONE MULLIKEN CORP.,** 4710 W. Division St., Chicago 51, Ill.
2—3

ROBINS CONVEYORS DIV., HEWITT-ROBINS INC., 270 Passaic Ave., Passaic, N. J.
7

•**IOWA MFG. CO.,** 916 16th St., N. E., Cedar Rapids, Iowa
2—3—4—7

THE JEFFREY MFG. CO., 935 N. 4th St., Columbus 16, Ohio
2—3—4—5—6—7

•**KENNEDY VAN SAUN MFG. & ENG. CORP.,** 2 Park Ave., New York 16, N. Y.
1—2—3—4—5—7

•**LIPPMANN ENGINEERING WORKS,** 4603 W. Mitchell St., Milwaukee 14, Wis.
1—2—4—7

THE McFARLANE-EGGERS MCHY. CO., 2763 Blake St., Denver 5, Colo.
5—7

THE MINE SMELTER SUPPLY CO., 1422 17th St., Denver 17, Colo.
5

MORSE BROS. MACHINERY CO., 2900 Brighton Blvd., Denver 1, Colo.
4—5—7

•**McLANAHAN AND STONE CORP.,** Hollidaysburg, Pa.
4—7

McNALLY PITTSBURGH MFG. CORP., Pittsburg, Kans.
3—4—7

•**NORDBERG MFG. CO.,** 3073 So. Chase Ave., Milwaukee 7, Wis.
1—4

PENNSYLVANIA CRUSHER CO., Liberty Trust Bldg., Philadelphia 7, Pa.
1—2—3—4—5—6—7

•**PETTIBONE MULLIKEN CORP., IMPACT MASTER DIV.,** 4700 W. Division St., Chicago 51, Ill.
3

•**PIONEER ENG. WORKS, INC.,** 1515 Central Ave., Minneapolis 13, Minn.
4—7

•**PRASCHAK MACHINE CO.,** Marshfield, Wis.
2

PRESSED STEEL CAR CO., INC., 25 Broad St., New York 4, N. Y.
7

PULVERIZING MACHINERY CO., Chatham Road, Summit, N. J.
2—4

ROGERS IRON WORKS CO., 11th & Pearl Sts., Joplin, Mo.
2—3—4—7

•**SMITH ENGINEERING WORKS,** 532 E. Capitol Dr., Milwaukee 12, Wis.
1—4—7

STEDMAN FOUNDRY & MACHINE CO., INC., Indiana Ave., Aurora, Ind.
2—3

STEPHENS-ADAMSON MFG. CO., 7 Ridgeway Ave., Aurora, Ill.
6—7

STRAUB MFG. CO., 456 Chestnut St., Oakland 7, Calif.
1—4—5

STROH PROCESS STEEL CO., 1428 High St., Pittsburgh 12, Pa.

STURTEVANT MILL CO., 102 Clayton St., Boston 22, Mass.
2—4—5—6—7

•**TRAYLOR ENGINEERING & MFG. CO.,** Allentown, Pa.
1—4—7

UNITED IRON WORKS CO., 108 No. Lucust, Pittsburg, Kans.
7

•**UNIVERSAL ENGINEERING CORP.,** 625 C Ave. N. W., Cedar Rapids, Iowa
2—3—4—5—7

UNIVERSAL ROAD MACHINERY CO., 27 Emerick St., Kingston, N. Y.
4

THE WEBB CORP., 402 E. Broadway, Webb City, Mo.
4—7

•**WILLIAMS PATENT CRUSHER & PULV. CO.,** 800 St. Louis Ave., St. Louis 6, Mo.
2—3—5—6—7

WIS. FOUNDRY & MACHINE CO., 623 E. Main St., Madison, Wis.
4—7

CRUSHING AND SCREENING PLANTS, Complete

ACME ROAD MACHINERY CO., East Main St., Frankfort, N. Y.

ALLEN CONE & MACHINERY CORP., 120 Broadway, New York 5, N. Y.

•**ALLIS-CHALMERS MFG. CO.,** 975 S. 70th St., Milwaukee 1, Wis.

ANCHOR CONCRETE MACHINERY CO., 1191 Fairview Ave., Columbus 12, Ohio

•**AUSTIN-WESTERN CO.,** 601 N. Farnsworth Ave., Aurora, Ill.

THE C. O. BARTLETT AND SNOW CO., 6200 Harvard Ave., Cleveland 5, Ohio

BODINSON MFG. CO., 2401 Bayshore Blvd., San Francisco 24, Calif.

THE CONVEYOR CO., 3260 East Slauson Ave., Los Angeles 11, Calif.

•**DIAMOND IRON WORKS, INC.,** 1728 2nd St. No., Minneapolis 11, Minn.

THE DORR CO., INC., Barry Pl., Stamford, Conn.

FARREL-BACON, Ansonia, Conn.

GREENVILLE MFG. WORKS, 1121½ W. 4th St., Greenville, Ohio

•**GRUENDLER CRUSHER & PULVERIZER CO.,** 2920 N. Market St., St. Louis 6, Mo.

•**HAMMERMILLS, INC., DIV. OF PETTIBONE MULLIKEN CORP.,** 4710 W. Division St., Chicago 51, Ill.

•**ROBINS ENGINEERS DIV., HEWITT-ROBINS INC.,** 270 Passaic Ave., Passaic, N. J.

•**IOWA MFG. CO.,** 916 16th St., N. E., Cedar Rapids, Iowa

•**LINK-BELT CO.,** 300 W. Pershing Road, Chicago 9, Ill.

•**LIPPMANN ENGINEERING WORKS,** 4603 W. Mitchell St., Milwaukee 14, Wis.

•**McLANAHAN AND STONE CORP.,** Hollidaysburg, Pa.

•**PETTIBONE MULLIKEN CORP., IMPACT MASTER DIV.,** 4700 W. Division St., Chicago 51, Ill.

•**PIONEER ENG. WORKS, INC.,** 1515 Central Ave., Minneapolis 13, Minn.

•**W. A. RIDDELL CORP.,** Bucyrus, Ohio

WM. E. ROBINSON & CO., 3633 **WM. E. ROBINSON & CO.,** 3307 Spring Garden St., Philadelphia 4, Pa.

ROGERS IRON WORKS CO., 11th & Pearl Sts., Joplin, Mo.

•**SMITH ENGINEERING WORKS,** 532 E. Capitol Dr., Milwaukee 12, Wis.

STEDMAN FOUNDRY & MACHINE CO., INC., Aurora, Ind.

STEPHENS-ADAMSON MFG. CO., 7 Ridgeway Ave., Aurora, Ill.

STRAUB MFG. CO., 456 Chestnut St., Oakland 7, Calif

•**TRAYLOR ENGINEERING & MFG. CO.,** Allentown, Pa.

UNITED IRON WORKS CO., 108 No. Locust, Pittsburg, Kans.

•**UNIVERSAL ENGINEERING CORP.,** 625 C Ave. N. W., Cedar Rapids, Iowa

UNIVERSAL ROAD MACHINERY CO., 27 Emerick St., Kingston, N. Y.

•**WILLIAMS PATENT CRUSHER & PULVERIZER CO., INC.,** 800 St. Louis Ave., St. Louis 6, Mo.

WIS. FOUNDRY & MACHINE CO., 623 E. Main St., Madison, Wis.

CRUSHING AND SCREENING PLANTS, Mobile Mounted

ACME ROAD MACHINERY CO., East Main St., Frankfort, N. Y.

ATHEY PRODUCTS CO., 5631 W. 65th St., Chicago 43, Ill.

•**AUSTIN-WESTERN CO.,** 601 N. Farnsworth, Aurora, Ill.

CONCRETE TRANSPORT MIXER CO., 4985 Fyler Ave., St. Louis 9, Mo.

•**DIAMOND IRON WORKS, INC.,** 1728 2nd St. No., Minneapolis 11, Minn.

EAGLE CRUSHER CO., INC., 900 Harding Way E., Galion, Ohio

•**FLEMING MFG. CO.,** 4985 Fyler Ave., St. Louis, Mo.

•**GRUENDLER CRUSHER & PULVERIZER CO.,** 2920 N. Market St., St. Louis 6, Mo.

•**IOWA MFG. CO.,** 916 16th St., N. E., Cedar Rapids, Iowa

•**LIPPMANN ENGINEERING WORKS,** 4603 W. Mitchell St., Milwaukee 14, Wis.

•**PETTIBONE MULLIKEN CORP., IMPACT MASTER DIV.,** 4700 W. Division St., Chicago 51, Ill.

•**PIONEER ENG. WORKS, INC.,** 1515 Central Ave., Minneapolis 13, Minn.

ROGERS IRON WORKS CO., 11th & Pearl Sts., Joplin, Mo.

•**SMITH ENGINEERING WORKS,** 532 E. Capitol Dr., Milwaukee 12, Wis.

STRAUB MFG. CO., 507 Chestnut St., Oakland 7, Calif.

•**UNIVERSAL ENGINEERING CORP.,** 625 C Ave. N. W., Cedar Rapids, Iowa

UNIVERSAL ROAD MACHINERY CO., 27 Emerick St., Kingston, N. Y.

•**WILLIAMS PATENT CRUSHER & PULV. CO., INC.,** 800 St. Louis Ave., St. Louis 6, Mo.

WIS. FOUNDRY & MACHINE CO., 623 E. Main St., Madison, Wis.

CUPOLAS, Rock Wool (see Rock Wool Cupolas and Equipment)

CURING COMPOUNDS, Concrete

ALUMINUM INDUSTRIES, INC., 2438 Beekman St., Cincinnati 25, Ohio

AUTOLENE LUBRICANTS CO., PROTEX DIV., 1331 W. Evans Ave., Denver 9, Colo.

THE CARTER-WATERS CORP., 2440 Pennway, Kansas City 8, Mo.

DEWEY AND ALMY CHEMICAL CO., 62 Whittemore Ave., Cambridge 40, Mass.

THE DOW CHEMICAL CO., Midland, Mich.

A. C. HORN CO., INC., 10th St & 44th Ave., Long Island City 1, N. Y.

•**THE MASTER BUILDERS CO.,** 7016 Euclid Ave., Cleveland 3, Ohio

PHILADELPHIA QUARTZ CO., Public Ledger Bldg., 6th & Chestnut Sts., Philadelphia 6, Pa.

REARDON INDUSTRIES, INC., 2837 Stanton Ave., Cincinnati 6, Ohio

•**SOLVAY SALES DIV., ALLIED CHEMICAL & DYE CORP.,** 40 Rector St., New York 6, N. Y.

L. SONNEBORN SONS, INC., 300 Fourth Ave., New York 10, N. Y.

SPRAY-O-BOND COMPANY, 2225 N. Humboldt Ave., Milwaukee 12, Wis.

WYANDOTTE CHEMICALS CORP., MICHIGAN ALKALI DIV., Wyandotte, Mich.

CURING ROOM DOORS

•**SHORE ENGINEERING,** 320 Broadway, New York, N. Y.

UNIVERSAL DOOR CARRIER, INC., 1117 Cornell Ave., Indianapolis 2, Ind.

CURING ROOM HEATERS

CAMPION FUEL ENG. DIV., P.O. Box 3941P, Detroit 27, Mich.

•**LITH-I-BAR CO.,** Sentinal Bldg., Holland, Mich.

• A dot before name indicates advertiser in this issue. See advertiser index.

DIRECTORY

CUTTER-HEADS, Dredging

BIRDSBORO STEEL FOUNDRY & MACHINE CO., Birdsboro, Pa.

CHICAGO STEEL FOUNDRY CO., 3720 S. Kedzie Ave., Chicago 32, Ill.

•**EAGLE IRON WORKS,** 137 Holcomb Ave., Des Moines 4, Iowa

ELLICOTT MACHINE CORP., 1611 Bush St., Baltimore 30, Md

GREENVILLE MFG. WORKS, 112½ W. 4th St., Greenville, Ohio

MECKUM ENGINEERING, INC., Dayton Rd., Ottawa, Ill.

•**TAYLOR-WHARTON IRON & STEEL CO.,** High Bridge, N. J.

CUTTERS, Fuse (see Blasting Supplies)

CUTTING WHEELS, Abrasive for Concrete

CARBORUNDUM CO., REFRACTORIES DIV., Perth Amboy, N. J.

•**CLIPPER MFG. CO.,** 2807 Warwick, Kansas City 8, Mo.

STONE MACHINERY CO., INC., 399 Fayette St., Manlius, N. Y.

VICTOR ENGINEERING CORP., 27 Maplewood Ave., Philadelphia 44, Pa.

D

DEDUSTERS

DEHYDRATORS (see Slurry Thickeners)

DERRICKS, Barge

•**AMERICAN HOIST & DERRICK CO.,** 63 S. Robert St., St. Paul 1, Minn.

BETHLEHEM STEEL CO., 701 E. Third St., Bethlehem, Pa.

CLYDE IRON WORKS, INC., P. O. Box 370, Duluth 1, Minn.

INGALLS SHIPBUILDING CORP., P. O. Drawer 2638, Birmingham 2, Ala.

SUPERIOR-LIDGERWOOD-MUNDY CORP., Superior, Wis.

DERRICKS, Stiff-Leg and Guy

•**AMERICAN HOIST & DERRICK CO.,** 63 S. Robert St., St. Paul 1, Minn.

BETHLEHEM STEEL CO., 701 E. Third St., Bethlehem, Pa.

CLYDE IRON WORKS, INC., P. O. Box 370, Duluth 1, Minn.

DOWNS CRANE & HOIST CO., 540 W. Vernon Ave., Los Angeles 37, Calif.

GAR WOOD INDUSTRIES, INC., WAYNE DIV., Wayne, Mich.

•**THE HAYWARD CO.,** 202-204 Fulton St., New York, N. Y.

SUPERIOR-LIDGERWOOD-MUNDY CORP., Superior, Wis.

DETONATORS (see Blasting Supplies)

DEWATERING EQUIPMENT, Sand (see Sand Recovery Machinery)

DIAPHRAGMS, Pumps, Rubber

CARLYLE RUBBER CO., INC., 62-66 Park Pl., New York 7, N. Y.

CARVER PUMP CO., 1056 Hershey Ave., Muscatine, Iowa

C. H. & E. MFG. CO., 3849 N. Palmer St., Milwaukee 12, Wis.

•**CHAIN BELT CO.,** 1600 W. Bruce St., Milwaukee 4, Wis.

CONSTRUCTION MACHINERY CO'S., Glenwood & Vinton Sts., Waterloo, Iowa

DENVER EQUIPMENT CO., 1410 Seventeenth St., Denver 17, Colo.

THE GATES RUBBER CO., 999 S. Broadway, Denver 17, Colo.

GOODALL RUBBER CO., Whitehead Road, Trenton 4, N. J.

•**THE GOODYEAR TIRE & RUBBER CO., INC.,** 1144 E. Market St., Akron 16, Ohio

HAMILTON RUBBER MFG. CORP. Mead St., Trenton 3, N. J.

E. F. HOUGHTON & CO., 303 W. Lehigh Ave., Philadelphia 33, Pa.

QUAKER RUBBER CORP., Tacony & Comly Sts., Philadelphia 24, Pa.

RAYBESTOS-MANHATTAN, INC., 61 Willett St., Passaic, N. J.

UNITED STATES RUBBER CO., 1230 Ave of the Americas, New York 20, N. Y.

•**WESTERN MACHINERY CO.,** 760 Folsom St., San Francisco 7, Cal.

DIESEL ENGINES, Automotive

THE BUDA COMPANY, 154th & Commercial, Harvey, Ill.

CONTINENTAL MOTORS CORP., 20 S. Market St., Muskegon, Mich.

THE COOPER-BESSEMER CORP., Mount Vernon, Ohio

CUMMINS ENGINE CO., INC., Fifth & Union Sts., Columbus, Ind.

•**DETROIT DIESEL ENGINE DIV., GENERAL MOTORS CORP.,** 13400 W. Outer Dr., Detroit 28, Mich

GREENVILLE MFG. WORKS, 112½ W. 4th St., Greenville, Ohio

•**HARNISCHFEGER CORP.,** 4400 W. National Ave., Milwaukee 14, Wis.

HERCULES MOTORS CORP., 101 Eleventh St., S. E., Canton 2, Ohio

•**MACK MFG. CORP.,** 350 Fifth Ave., New York 1, N. Y.

MURPHY DIESEL CO., 5317 W. Burnham St., Milwaukee 14, Wis.

PAGE ENGINEERING CO., Clearing P.O., Chicago 38, Ill.

SHEPPARD DIESELS, Philadelphia St., Hanover, Pa.

WAUKESHA MOTOR CO., West St. Paul Ave., Waukesha, Wis.

DIESEL ENGINES, Stationary

1. **Less than 100 H.P.**
2. **100-500 H.P.**
3. **500-1000 H.P.**
4. **Over 1000 H.P.**

B. F. M. INDUSTRIES, INC., 2124 Mill Ave., Brooklyn 34, N. Y.
1—2—3—4

THE BALDWIN LOCOMOTIVE WORKS, Philadelphia 42, Pa.
2—3—4

THE BUDA COMPANY, 154th & Commercial, Harvey, Ill.
1—2—3

•**CATERPILLAR TRACTOR CO.,** Peoria 8, Ill.
1—2

•**CHICAGO PNEUMATIC TOOL CO.,** 6 E. 44th St., New York 17, N. Y.
2—3—4

CONTINENTAL MOTORS CORP., 20 S. Market St., Muskegon, Mich.
1—2

THE COOPER-BESSEMER CORP., Mount Vernon, Ohio
2—3—4

CUMMINS ENGINE CO., INC., Fifth & Union Sts., Columbus, Ind.
2—3

•**DETROIT DIESEL ENGINE DIV., GENERAL MOTORS CORP.,** 13400 W. Outer Dr., Detroit 28, Mich.
1—2—3

FAIRBANKS MORSE & CO., 600 S. Michigan Ave., Chicago 5, Ill.
1—2—3—4

GREENVILLE MFG. WORKS, 112½ W. 4th St., Greenville, Ohio

•**HARNISCHFEGER CORP.,** 4400 W. National Ave., Milwaukee 14, Wis.
1—2

HERCULES MOTORS CORP., 101 Eleventh St., S. E., Canton 2, Ohio
1—2

INTERNATIONAL HARVESTER CO., 180 N. Michigan Ave., Chicago 1, Ill.
1—2

LISTER BLACKSTONE INC., 420 Lexington Ave., New York 17 N. Y.
1—2

LORIMER ENGINE DIV., ATLAS IMPERIAL DIESEL ENGINE CO., 1000 19th Ave., Oakland 6, Calif.
1—2

MURPHY DIESEL CO., 5317 W. Burnham St., Milwaukee 14, Wis.
1—2

THE NATIONAL SUPPLY CO., ENGINE DIV., 1401 Sheridan, Springfield 99, Ohio
2—3—4

•**NORDBERG MFG. CO.,** 3073 So. Chase Ave., Milwaukee 7, Wis.
1—2—3—4

SHEPPARD DIESELS, Philadelphia St., Hanover, Pa.
1

WAUKESHA MOTOR CO., Box 379, Waukesha, Wis.
1—2

WITTE ENGINE WORKS, DIV. OF OIL WELL SUPPLY CO., 1600 Oakland Ave., Kansas City 3, Mo.
1

WORTHINGTON PUMP & MACHINERY CORP., Worthington Ave., Harrison, N. J.
1—2—3—4

DIPPER TEETH AND PARTS (see Bucket Lips & Teeth)

DIPPERS, Dredge & Shovel (see Buckets)

DRAFT GAUGES

•**BAILEY METER CO.,** 1050 Ivanhoe Road, Cleveland 10, Ohio

THE BRISTOL CO., Waterbury 20, Conn.

ELLISON DRAFT GAGE CO., 214 W. Kinzie St., Chicago 10, Ill.

THE HAYS CORP., East 8th St., Michigan City, Ind.

MANNING, MAXWELL & MOORE, INC., 250 E. Main, Stratford, Conn.

DRAGLINE CABLEWAY EXCAVATORS

ATLAS CORPORATION, Mountville, Pa.

GODFREY CONVEYOR CO., 13th & Wolf Ave., Elkhart, Ind.

SUPERIOR-LIDGERWOOD-MUNDY CORP., Superior, Wis.

TRIANGLE ENGINEERING CO., 2848 W. 26th St., Chicago 23, Ill.

DRAG LINES, Crawler

1. **Diesel**
2. **Electric**
3. **Gasoline**

•**AMERICAN HOIST & DERRICK CO.,** 63 S. Robert St., St. Paul 1, Minn.
1—2—3

BAY CITY SHOVELS, INC., Bay City, Mich.
1—3

THE BROWNING CRANE & SHOVEL CO., 16226 Waterloo Road, Cleveland 10, Ohio
1—2—3

•**BUCYRUS-ERIE CO.,** South Milwaukee, Wis.
1—2—3

THE BYERS MACHINE CO., Lock Box 390, Ravenna, Ohio
1—3

THE HANSON CLUTCH & MACHINERY CO., Wall & Miami Sts., Tiffin 15, Ohio
1—3

•**HARNISCHFEGER CORP.,** 4400 W. National Ave., Milwaukee 14, Wis.
1—2—3

HYSTER COMPANY, 2918 N. E. Clackamas St., Portland 8, Ore.

INSLEY MFG. CORP., 801 N. Olney, Indianapolis 1, Ind.
1—2—3

•**KOEHRING CO.,** 3026 W. Concordia Ave., Milwaukee 16, Wis.
1—2—3

LIMA HAMILTON DIV., OF BALDWIN - LIMA - HAMILTON CORP., South Main St., Lima, Ohio
1—2—3

LINK-BELT SPEEDER CORP., 1201 Sixth St., S. W., Cedar Rapids, Iowa
1—2—3

MANITOWOC ENGINEERING WORKS., Manitowoc, Wis.
1—2—3

MARION POWER SHOVEL CO., 617 W. Center St., Marion, Ohio
1—2—3

MICHIGAN POWER SHOVEL CO., 250 Miller Road, Benton Harbor, Mich.
1—3

•**NORTHWEST ENGINEERING CO.,** 135 S. LaSalle St., Chicago 3, Ill.
1—2—3

•**THE OSGOOD CO.,** Marion, Ohio
1—2—3

•**THE THEW SHOVEL CO.,** 1000 E. 28th St., Lorain, Ohio
1—2—3

•**UNIT CRANE & SHOVEL CORP.,** 6411 W. Burnham St., Milwaukee 14, Wis.
1—3

WAYNE CRANE DIV., AMERICAN STEEL DREDGE CO., INC., P. O. Box 570, Fort Wayne 1, Ind.
1—3

DRAGLINES, Truck Mounted

•**AMERICAN HOIST & DERRICK CO.,** 63 S. Robert St., St. Paul 1, Minn.

BAY CITY SHOVELS, INC., Bay City, Mich.

THE BROWNING CRANE & SHOVEL CO., 16226 Waterloo Road, Cleveland 10, Ohio

•**BUCYRUS-ERIE CO.,** South Milwaukee, Wis.

THE BYERS MACHINE CO., Lock Box 390, Ravenna, Ohio

THE HANSON CLUTCH & MACHINERY CO., Wall & Miami Sts., Tiffin 15, Ohio

•**HARNISCHFEGER CORP.,** 4400 W. National Ave., Milwaukee 14, Wis.

INSLEY MFG. CORP., 801 N. Olney, Indianapolis 1, Ind.

• A dot before name indicates advertiser in this issue. See advertiser index.

DIRECTORY

●**KOEHRING CO.,** 3026 W. Concordia Ave., Milwaukee 16, Wis.

LIMA HAMILTON DIV., OF BALDWIN - LIMA - HAMILTON CORP., South Main St., Lima, Ohio

LINK-BELT SPEEDER CORP., 1201 Sixth St., S. W., Cedar Rapids, Iowa

MICHIGAN POWER SHOVEL CO., 250 Miller Road, Benton Harbor, Mich.

●**NORTHWEST ENGINEERING CO.,** 135 S. LaSalle St., Chicago 3, Ill.

●**THE OSGOOD CO.,** Marion, Ohio

●**"QUICK-WAY" TRUCK SHOVEL CO.,** 2401 E. 40th Ave., Denver 5, Colo.

●**SCHIELD BANTAM CO.,** 216 Park St., Waverly, Iowa

●**THE THEW SHOVEL CO.,** 1000 E. 28th St., Lorain, Ohio

UNIT CRANE & SHOVEL CORP., 6411 W. Burnham St., Milwaukee 14, Wis.

WAYNE CRANE DIV., AMERICAN STEEL DREDGE CO., INC., P. O. Box 570, Fort Wayne 1, Ind.

DRAGLINES, Walking

1. **Diesel**
2. **Electric**
3. **Gasoline**
4. **Electric Generator**

●**BUCYRUS-ERIE CO.,** South Milwaukee, Wis.
1—2—3—4

GODFREY CONVEYOR CO., 13th & Wolf Ave., Elkhart, Ind.
2—3

MARION POWER SHOVEL CO., 617 W. Center St., Marion, Ohio
1—2

PAGE ENGINEERING CO., Clearing P. O., Chicago 38, Ill.
1—2

DRAGS, Sand (see Sand Recovery Machinery)

DREDGE HOISTS

●**AMERICAN HOIST & DERRICK CO.,** 63 S. Robert St., St. Paul 1, Minn.

CLYDE IRON WORKS, INC., P.O. Box 370, Duluth 1, Minn.

ELLICOTT MACHINE CORP., 1611 Bush St., Baltimore 30, Md.

GEORGIA IRON WORKS CO., 605 12th St., Augusta, Ga.

GREENVILLE MFG. WORKS, 1121½ W. Fourth St., Greenville, Ohio

MORRIS MACHINE WORKS, Baldwinsville, N. Y.

SUPERIOR - LIDGERWOOD - MUNDY CORP., 7 Dey St., New York 7, N. Y.

DREDGE PIPE AND FITTINGS

●**AMERICAN MANGANESE STEEL DIV. OF AMERICAN BRAKE SHOE CO.,** 401 E. 14th St., Chicago Heights, Ill.

AMERICAN STEEL DREDGE CO., INC., 2511 Taylor St., Fort Wayne 6, Ind.

BETHLEHEM STEEL CO., 701 E. Third St., Bethlehem, Pa.

BIRDSBORO STEEL FOUNDRY & MACHINE CO., Birdsboro, Pa.

ELECTRIC STEEL FOUNDRY CO., 2141 N. W. 25th Ave., Portland 10, Oreg.

ELLICOTT MACHINE CORP., 1611 Bush St., Baltimore 30, Md.

ERIE PUMP & ENGINE WORKS, 163 Glenwood Ave., Medina, N. Y.

●**THE FROG, SWITCH & MFG. CO.,** Carlisle, Pa.

GREENVILLE MFG. WORKS, 1121½ W. 4th., Greenville, Ohio

HETHERINGTON & BERNER, INC., 701-745 Kentucky Ave., Indianapolis 7, Ind.

KANSAS CITY HAY PRESS CO., 801 Woodswether Road, Kansas City 6, Mo.

MANGANESE STEEL FORGE CO., Richmond St. & Castor Ave., Philadelphia 34, Pa.

MECKUM ENGINEERING, INC., Dayton Rd., Ottawa, Ill.

MORRIS MACHINE WORKS, Baldwinsville, N. Y.

TAYLOR FORGE & PIPE WORKS, P. O. Box 485, Chicago 90, Ill.

DREDGE PIPE SLEEVES

AMERICAN STEEL DREDGE CO., INC., 2511 Taylor St., Fort Wayne 6, Ind.

CARLYLE RUBBER CO., INC., 62-66 Park Pl., New York 7, N. Y.

ELLICOTT MACHINE CORP., 1611 Bush St., Baltimore 30, Md.

●**THE FROG, SWITCH & MFG. CO.,** Carlisle, Pa.

THE GATES RUBBER CO., 999 S. Broadway, Denver 17, Colo.

GEORGIA IRON WORKS CO., 605 12th St., Augusta, Ga.

GOODALL RUBBER CO., Whitehead Road, Trenton 4, N. J.

●**THE GOODYEAR TIRE & RUBBER CO., INC.,** 1144 E. Market St., Akron 16, Ohio

GREENVILLE MFG. WORKS, 1121½ W. 4th St., Greenville, Ohio

HETHERINGTON & BERNER, INC., 701-745 Kentucky Ave., Indianapolis 7, Ind.

MECKUM ENGINEERING, INC., Dayton Rd., Ottawa, Ill.

MORRIS MACHINE WORKS, Baldwinsville, N. Y.

QUAKER RUBBER CORP., Tacony & Comly Sts., Philadelphia 24, Pa.

RAYBESTOS-MANHATTAN, INC., 61 Willett St., Passaic, N. J.

●**REPUBLIC RUBBER DIV., LEE RUBBER & TIRE CORP.,** Albert St., Youngstown 1, Ohio

UNITED STATES RUBBER CO., 1230 Ave. of the Americas, New York 20, N. Y.

DREDGE PUMPS (see Pumps, Dredge)

DREDGES, Sand & Gravel

1. **Bucket**
2. **Ladder**
3. **Pump**

AMERICAN STEEL DREDGE CO., INC., 2511 Taylor St., Fort Wayne 6, Ind.
2—3

●**AMERICAN MANGANESE STEEL DIV. OF AMERICAN BRAKE SHOE CO.,** 401 E. 14th St., Chicago Heights, Ill.
3

BETHLEHEM STEEL CO., 701 E. Third St., Bethlehem, Pa.
1—2—3

●**BUCYRUS-ERIE CO.,** South Milwaukee, Wis.
1—2—3

●**EAGLE IRON WORKS,** 137 Holcomb Ave., Des Moines 4, Iowa
2

ELLICOTT MACHINE CORP., 1611 Bush St., Baltimore 30, Md.
1—2—3

GEORGIA IRON WORKS CO., 605 12th St., Augusta, Ga.
3

GREENVILLE MFG. WORKS, 1121½ W. 4th St., Greenville, Ohio
2—3

HETHERINGTON & BERNER INC., 701-745 Kentucky Ave., Indianapolis 7, Ind.
3

INGALLS SHIPBUILDING CORP., P.O. Drawer 2638, Birmingham 2, Ala.
1—2—3

MANITOWOC ENGINEERING WORKS, Manitowoc, Wis.
1—2—3

MECKUM ENGINEERING, INC., Dayton Rd., Ottawa, Ill.
2—3

MILLVILLE IRON WORKS, INC., 6th St. & Florence Ave., Millville, N. J.
2—3

MORRIS MACHINE WORKS, Baldwinsville, N. Y.
2

STRAUB MFG. CO., 507 Chestnut St., Oakland 7, Calif.
1

THE WELLMAN ENGINEERING CO., 7000 Central Ave., Cleveland 5, Ohio
1

●**YUBA MFG. CO.,** 351 California St., San Francisco 4, Calif.
1—2

DRIFTERS

●**CHICAGO PNEUMATIC TOOL CO.,** 6 E. 44th St., New York 17, N. Y.

●**GARDNER-DENVER CO.,** Quincy, Ill.

INDEPENDENT PNEUMATIC TOOL CO., 175 State, Aurora, Ill.

INGERSOLL-RAND CO., 11 Broadway, New York 4, N. Y.

●**JOY MANUFACTURING CO.,** Henry W. Oliver Bldg., Pittsburgh 22, Pa.

DRILL BITS (see Bits)

DRILL STEEL

BETHLEHEM STEEL CO., 701 E. Third St., Bethlehem, Pa.

●**CHICAGO PNEUMATIC TOOL CO.,** 6 E. 44th St., New York 17, N. Y.

HARDSOGG PNEUMATIC TOOL CO., 225 So. Benton St., Ottumwa, Iowa

ROCK BIT SALES & SERVICE CO., 2514 E. Cumberland St., Philadelphia 25, Pa.

●**JOSEPH T. RYERSON & SON, INC.,** 2558 West 16th St., Chicago 80, Ill.

WIS. FOUNDRY & MACHINE CO., 623 E. Main St., Madison, Wis.

WORTHINGTON PUMP & MACHINERY CORP., Worthington Ave., Harrison, N. J.

DRILLING ACCESSORIES

ACKER DRILL CO., INC., 721 W. Lackawanna Ave., Scranton 3, Pa.

●**BUCYRUS-ERIE CO.,** South Milwaukee, Wis.

●**CHICAGO PNEUMATIC TOOL CO.,** 6 E. 44th St., New York 17, N. Y.

THE EIMCO CORP., P. O. Box 300, Salt Lake City 10, Utah

●**GARDNER-DENVER CO.,** Quincy, Ill.

INDEPENDENT PNEUMATIC TOOL CO., 175 State St., Aurora, Ill.

INGERSOLL-RAND CO., 11 Broadway, New York 4, N. Y.

KEYSTONE DRILLER CO., 8th Ave., Beaver Falls, Pa.

MACWHYTE CO., 2949 14th Ave., Kenosha, Wis.

SPRAGUE & HENWOOD, INC., 221 W. Olive St., Scranton 2, Pa.

WALL ROPE WORKS, INC., 48 South St., New York 5, N. Y.

WORTHINGTON PUMP & MACHINERY CORP., Worthington Ave., Harrison, N. J.

DRILLING CABLE, Manila, Sisal, etc.

●**MACWHYTE CO.,** 2949 14th Ave., Kenosha, Wis.

THE SANDERSON CYCLONE DRILL CO., 157 S. Main St., Orrville, Ohio

DRILLS, Core

ACKER DRILL CO., INC., 721 W. Lackawanna Ave., Scranton 3, Pa.

●**CHICAGO PNEUMATIC TOOL CO.,** 6 E. 44th St., New York 17, N. Y.

INGERSOLL-RAND CO., 11 Broadway, New York 4, N. Y.

●**JOY MANUFACTURING CO.,** Henry W. Oliver Bldg., Pittsburgh 22, Pa.

E. J. LONGYEAR CO., 1701 Foshay Tower, Minneapolis 2, Minn.

SPRAGUE & HENWOOD, INC., 221 W. Olive St., Scranton 2, Pa.

DRILLS, Rock

1. **Electric**
2. **Gasoline**
3. **Pneumatic**

BARCO MANUFACTURING CO., 1801-1815 Winnemac Ave., Chicago 40, Ill.
1—2

●**CHICAGO PNEUMATIC TOOL CO.,** 6 E. 44th St., New York 17, N. Y.
1—2—3

●**GARDNER-DENVER CO.,** Quincy, Ill.
3

HARDSOGG PNEUMATIC TOOL CO., 225 So. Benton St., Ottumwa, Iowa
3

HOSSFELD MFG. CO., Winona, Minn.
2

INDEPENDENT PNEUMATIC TOOL CO., 175 State St., Aurora, Ill.
1—3

INGERSOLL-RAND CO., 11 Broadway, New York 4, N. Y.
3

●**JOY MANUFACTURING CO.,** Henry W. Oliver Bldg., Pittsburgh 22, Pa.
3

●**LEROI CO.,** 1706 So. 68th St., Milwaukee, Wis.
3

LINDE AIR PRODUCTS CO., DIV. UNION CARBIDE & CARBON CORP., 30 E. 42nd St., New York 17, N. Y.

THE LOOMIS MACHINE CO., 15 E. Market St., Tiffin, Ohio

SALEM TOOL CO., 700 S. Ellsworth St., Salem, Ohio
1—2

SANDVIK STEEL, INC., 111 Eighth Ave., New York 11, N. Y
3

SPRAGUE & HENWOOD, INC., 221 W. Olive St., Scranton 2, Pa.
1—2—3

STRAUB MFG. CO., 456 Chestnut St., Oakland, Calif.
2—3

●**SYNTRON CO.,** 450 Lexington Ave., Homer City, Pa.
2

WARSOP POWER TOOLS, INC., 347 N. 12th St., Philadelphia 7, Pa.
2

WORTHINGTON PUMP & MACHINERY CORP., Worthington Ave., Harrison, N. J.
3

DRILLS, Stoper

●**CHICAGO PNEUMATIC TOOL CO.,** 6 E. 44th St., New York 17, N. Y.

●**GARDNER-DENVER CO.,** Quincy, Ill.

● A dot before name indicates advertiser in this issue. See advertiser index.

DIRECTORY

INDEPENDENT PNEUMATIC TOOL CO., 175 State St., Aurora, Ill.

INGERSOLL-RAND CO., 11 Broadway, New York 4, N. Y.

•**JOY MANUFACTURING CO.**, Henry W. Oliver Bldg., Pittsburgh 22, Pa.

THE SANDERSON CYCLONE DRILL CO., 157 S. Main St., Orville, Ohio

SANDVIK STEEL, INC., 111 Eighth Ave., New York 11, N. Y.

DRILLS, Well or Blast-Hole

ACKER DRILL CO., INC., 721 W. Lackawanna Ave., Scranton 3, Pa.

•**BUCYRUS-ERIE CO.**, South Milwaukee, Wis.

•**CHICAGO PNEUMATIC TOOL CO.**, 6 E. 44th St., New York 17, N. Y.

HOSSFELD MFG. CO., Winona, Minn.

INGERSOLL-RAND CO., 11 Broadway, New York 4, N. Y.

•**JOY MANUFACTURING CO.**, Henry W. Oliver Bldg., Pittsburgh 22, Pa.

KEYSTONE DRILLER CO., 8th Ave., Beaver Falls, Pa.

THE LOOMIS MACHINE CO., 15 E. Market St., Tiffin, Ohio

SALEM TOOL CO., 700 S. Ellsworth St., Salem, Ohio

THE SANDERSON CYCLONE DRILL CO., 157 S. Main St., Orrville, Ohio

SANDVIK STEEL, INC., 111 Eighth Ave., New York 11, N. Y.

SPRAGUE & HENWOOD, INC., 221 W. Olive St., Scranton 2, Pa.

STAR DRILLING MACHINE CO., 474 Washington St., Akron 11, Ohio

UNITED IRON WORKS CO., 108 No. Locust, Pittsburg, Kans.

DRIVES

1. Chain
2. Flat Belt
3. Flexible Shaft
4. Gear
5. Short Center
6. Variable Speed
7. V-Belt

•**ALLIS-CHALMERS MFG. CO.**, 975 So. 70th St., Milwaukee 1, Wis.
4—5—6—7

THE AMERICAN PULLEY CO., 4200 Wissahickon Ave., Philadelphia 29, Penna.
2—6—7

THE C. O. BARTLETT AND SNOW CO., 6200 Harvard Ave., Cleveland 5, Ohio
1—4

BODINSON MFG. CO., 2401 Bayshore Blvd., San Francisco 24, Calif.
1—3—7

CARLYLE RUBBER CO., INC., 62-66 Park Pl., New York 7, N. Y.
2—7

•**CHAIN BELT CO.**, 1600 W. Bruce St., Milwaukee 4, Wis.
1—3

THE CLEVELAND WORM & GEAR CO., 3249 E. Eightieth St., Cleveland 4, Ohio
4—6

•**CONTINENTAL GIN CO.**, 4500 5th Ave. S., Birmingham, Ala.
1—2—4—6—7

THE CONVEYOR CO., 3260 East Slauson Ave., Los Angeles 11, Calif.
1—3—4

COOK BROS. EQUIPMENT CO., 1815 N. Broadway, Los Angeles 31, Calif.
1—4

CROCKER-WHEELER ELECTRIC MFG. CO., DIV. OF ELLIOTT CO., Ampere, N. J.
5

THE DAYTON RUBBER CO., Dayton 1, Ohio
7

DE LAVAL STEAM TURBINE CO., Trenton 2, N. J.
3—4

DIAMOND CHAIN CO., INC., 402 Kentucky Ave., Dept. 520, Indianapolis 7, Ind.
5

•**DIAMOND IRON WORKS, INC.**, 1728 2nd St. No., Minneapolis 11, Minn.
2—7

DODGE MANUFACTURING CORP., Mishawaka, Ind.
2—3—4—6—7

DYNAMATIC CORP., 3307 14th Ave., Kenosha, Wis.
6

EATON MANUFACTURING CO., 739 E. 140 St., Cleveland 10, Ohio
6

•**THE J. B. EHRSAM & SONS MFG. CO.**, Enterprise, Kans.
1—2—4—5—7

ELECTRIC MACHINERY MFG. CO., 1331 Tyler St., N.E., Minneapolis 14, Minn.
6

THE FALK CORP., 3001 W. Canal St., Milwaukee 8, Wis.
4

•**FARREL - BIRMINGHAM, INC.**, Ansonia, Conn.
4

•**THE FIRESTONE TIRE & RUBBER CO.**, 1200 Firestone Pkwy., Akron 17, Ohio

FOOTE BROS. GEAR & MACHINE CO., 4545 S. Western Blvd., Chicago 9, Ill.
3—4

THE GATES RUBBER CO., 999 S. Broadway, Denver 17, Colo.
6—7

GENERAL CONVEYOR & MFG. CO., 3601 Salena St., St. Louis 18, Mo.
1—3

•**GENERAL ELECTRIC CO.**, 1 River Road, Schenectady 5, N. Y.
4—6

•**THE GOODYEAR TIRE & RUBBER CO., INC.**, 1144 E. Market St., Akron 16, Ohio
2—7

GREENVILLE MFG. WORKS, 112½ W. 4th, Greenville, Ohio
7

E. F. HOUGHTON & CO., 303 W. Lehigh Ave., Philadelphia 33, Pa.
2

D. O. JAMES MFG. CO., 1114 W. Monroe St., Chicago 7, Ill.
6

THE JEFFREY MFG. CO., 935 N. 4th St., Columbus 16, Ohio
1

W. A. JONES FOUNDRY & MACHINE CO., 4401 Roosevelt Rd., Chicago 24, Ill.
4

KENSINGTON STEEL CO., 505 Kensington St., Chicago 28, Ill.
1

KOPPERS CO., INC., Koppers Bldg., Pittsburgh 19, Pa.
3

•**LINK-BELT CO.**, 300 W. Pershing Road., Chicago 9, Ill.
1—3—4—5—6—7

LOVEJOY FLEXIBLE COUPLING CO., 5009 W. Lake St., Chicago 44, Ill.
3—6—7

E. F. MARSH ENG. CO., 4324 W. Clayton Ave., St. Louis 10, Mo.
1—4—6—7

MORSE CHAIN CO., 7601 Central Ave., Detroit 8, Mich.
1—3

PHILADELPHIA GEAR WORKS., Erie Ave. & G St., Philadelphia, Pa.
4

PYOTT FOUNDRY & MACHINE CO., 328 N. Sangamon, Chicago 7, Ill.
7

REEVES PULLEY CO., Columbus, Ind.
6

RELIANCE ELECTRIC & ENGINEERING CO., 1088 Ivanhoe Rd., Cleveland 10, Ohio
4—6

J. R. RHOADS & SONS, 35 N. 6th St., Philadelphia 6, Pa.
2—5

•**SMITH ENGINEERING WORKS**, 532 E. Capitol Dr., Milwaukee 12, Wis.
1—2—3—4—5—6—7

STEPHENS-ADAMSON MFG. CO., 7 Ridgeway Ave., Aurora, Ill.
1—6—7

•**STERLING ELECTRIC MOTORS, INC.**, 5401 Anaheim-Telegraph Road, Los Angeles 22, Calif.
6

STOW MANUFACTURING CO., 49 Shear St., Binghamton, N. Y.
3

UNITED IRON WORKS CO., 108 No. Locust, Pittsburg, Kans.
1—4—7

U. S. ELECTRICAL MOTORS INC., 200 E. Slauson Ave., Los Angeles 54, Calif.
4—6

VICKERS INC., DIV. SPEERY CORP., 1400 Oakman Blvd., Detroit 32, Mich.
6

JOHN WALDRON CORP., River Road, New Brunswick, N. J.
3

WESTINGHOUSE ELECTRIC CO., First Nat'l Bank Bldg., Pittsburgh, Pa.
4—6

WIS. FOUNDRY & MACHINE CO., 623 E. Main, Madison, Wis.
1—7

WORTHINGTON PUMP & MACHINERY CORP., Worthington Ave., Harrison, N. J.
6—7

DROP BALLS

•**CAPE ANN ANCHOR & FORGE CO.**, Whittemore St., Gloucester, Mass.

•**THE J. B. EHRSAM & SONS MFG. CO.**, Enterprise, Kans.

FREDERICK IRON & STEEL CO., Frederick, Md.

•**TAYLOR - WHARTON IRON & STEEL CO.**, High Bridge, N. J.

WIS. FOUNDRY & MACHINE CO., 623 E. Main, Madison, Wis.

DRY PANS

THE BONNOT CO., 722 Mulberry S.E., Canton 2, Ohio

•**EAGLE IRON WORKS**, 137 Holcomb Ave., Des Moines 4, Iowa

THE EIMCO CORP., P. O. Box 300, Salt Lake City 8, Utah

•**KENNEDY VAN SAUN MFG. & ENG. CORP.**, 2 Park Ave., New York 16, N. Y.

THE PATTERSON FOUNDRY & MACHINE CO., 1250 St. George St., East Liverpool, Ohio

•**McLANAHAN AND STONE CORP.**, Hollidaysburg, Pa.

•**W. A. RIDDELL CORP.**, Bucyrus, Ohio

DRYERS, Rotary, Gravel, Rock, Sand

•**ALLIS-CHALMERS MFG. CO.**, 975 So. 70th St., Milwaukee 1, Wisc.

THE C. O. BARTLETT AND SNOW CO., 6200 Harvard Ave., Cleveland 5, Ohio

•**BARBER-GREENE CO.**, 631 W. Park Ave., Aurora, Ill.

BETHLEHEM STEEL CO., 701 E. Third St., Bethlehem, Pa.

BODINSON MFG. CO., 2401 Bayshore Blvd., San Francisco 24, Calif.

THE BONNOT CO., 722 Mulberry S.E., Canton 2, Ohio

CENTRIFUGE MECHANICAL EQPT., INC., 95 River St., Hoboken, N. J.

COLORADO IRON WORKS CO., 1624 17th St., Denver 2, Colo.

•**DENVER EQUIPMENT CO.**, 1410 Seventeenth St., Denver 17, Colo.

DIAMOND IRON WORKS, INC., 1728 2nd St. No., Minneapolis 11, Minn.

THE EIMCO CORP., P.O. Box 300, Salt Lake City 8, Utah

GENERAL AMERICAN TRANSPORTATION CORP., Field Bldg., Room 3105, 135 So. LaSalle St., Chicago 90, Ill.

•**HARDINGE CO., INC.**, 240 Arch St., York, Pa.

HETHERINGTON & BERNER, INC., 701-745 Kentucky Ave., Indianapolis 7, Ind.

•**W. P. HEINEKEN CO.**, 227 Fulton St., New York 7, N. Y.

INDIANA FOUNDRY CO., 150 Clymer Ave., Indiana, Pa.

•**IOWA MFG. CO.**, 916 16th St., N.E., Cedar Rapids, Iowa

•**KENNEDY VAN SAUN MFG. & ENG. CORP.**, 2 Park Ave., New York 16, N. Y.

•**LINK-BELT CO.**, 300 W. Pershing Road., Chicago 9, Ill.

MILLVILLE IRON WORKS INC., 6th St. & Florence Ave., Millville, N. J.

McDERMOTT BROS. CO., Ft. of Washington St., Allentown, Pa.

•**McLANAHAN AND STONE CORP.**, Hollidaysburg, Pa.

•**NORDBERG MFG. CO.**, 3073 So. Chase Ave., Milwaukee 7, Wisc.

NOVERA INC., 420 Lexington Ave., New York 17, N. Y.

THE PATTERSON FOUNDRY & MACHINE CO., 1250 St. George St., East Liverpool, Ohio

•**PIONEER ENG. WORKS, INC.**, 1515 Central Ave., Minneapolis 13, Minn.

POSEY IRON WORKS, INC., INDUSTRIAL HEATING DIVN., 560 S. Prince St., Lancaster, Pa.

SIMPLICITY SYSTEM CO., Riverside Dr., Chattanooga 6, Tenn.

•**F. L. SMIDTH & CO.**, 11 W. 42nd St., New York 18, N. Y.

•**TRAYLOR ENGINEERING & MFG. CO.**, Allentown, Pa.

WEBBER EQUIPMENT CORP., 10 E. 44th St., New York 17, N. Y.

WESTERN PRECIPITATION CORP., 1016 W. Ninth St., Los Angeles 15, Calif.

DRYERS, Plaster Board

CENTRIFUGE MECHANICAL EQPT., INC., 95 River St., Hoboken, N. J.

•**THE COE MFG. CO.**, Bank St., Painesville, Ohio

NOVERA INC., 420 Lexington Ave., New York 17, N. Y.

WESTERN PRECIPITATION CORP., 1016 W. Ninth St., Los Angeles 15, Calif.

DRYERS, Steam Coil

CENTRIFUGE MECHANICAL EQPT., INC., 95 River St., Hoboken, N. J.

GENERAL AMERICAN TRANSPORTATION CORP., Field Bldg., Room 3105, 135 So. LaSalle St., Chicago 90, Ill.

•**HARDINGE CO., INC.**, 240 Arch St., York, Pa.

MILLVILLE IRON WORKS INC., 6th St. & Florence Ave., Millville, N. J.

NOVERA INC., 420 Lexington Ave., New York 17, N. Y.

• A dot before name indicates advertiser in this issue. See advertiser index.

DIRECTORY

DUMPING MECHANISMS, Truck

ANTHONY COMPANY, Streator, Ill.

DEMPSTER BROTHERS, INC., Springdale St., Knoxville 17, Tenn.

EASTON CAR & CONSTRUCTION CO., Easton, Pa.

GAR WOOD INDUSTRIES, INC., Wayne Div., Wayne, Mich.

HENNEUSE ENG. CO., Marion, Ohio

KEWANEE MANUFACTURING CO., Department RP, Kewanee, Ill.

LANDIS STEEL CO., 116 W. A St., Picher, Okla.

THE MARION METAL PRODUCTS CO., Cheney Ave. & Otis St., Marion, Ohio

THE PERFECTION STEEL BODY CO., S. East St., Galion, Ohio

•**SCHONROCK EQUIPMENT MFG. CO.,** P.O. Box 1543, San Angelo, Texas

DUST COLLECTING EQUIPMENT ACCESSORIES

AMERICAN BLOWER CORP., Box 58 Roosevelt Annex, Detroit 32, Mich.

AMERICAN VENTILATING HOSE CO., 100 Park Ave., New York 17, N. Y.

AMERICAN WHEELABRATOR & EQUIP. CORP., 439 S. Byrkit St., Mishawaka, Ind.

THE C. O. BARTLETT AND SNOW CO., 6200 Harvard Ave., Cleveland 5, Ohio

CARLYLE RUBBER CO., INC., 62-66 Park Pl., New York 7, N. Y.

THE DAY COMPANY, 810 Third Ave., N. E. Mpls. 13, Minn.

•**IOWA MFG. CO.,** 916 16th St. N.E., Cedar Rapids, Iowa

THE KIRK & BLUM MFG. CO., 3120 Forrer Ave., Cincinnati 9, Ohio

THE MACLEOD CO., 2232-40 Bogen St., Cincinnati 22, Ohio

PANGBORN CORP., 120 Pangborn Blvd., Hagerstown, Md.

PULVERIZING MACHINERY CO., 57 Chatham Rd., Summit, N. J.

•**THE W. W. SLY MFG. CO.,** 4700 Train Ave., Cleveland 2, Ohio

WESTERN PRECIPITATION CORP., 1016 West Ninth St., Los Angeles 15, Calif.

WHITING CORP., 15693 Lathrop Ave., Harvey, Ill.

DUST COLLECTORS

1. **Bag Type**
2. **Cyclone**
3. **Electric Precipitators**
4. **Hydraulic**
5. **Portable**

AIRFAN ENGINEERING CO., 7401 Ana Telegraph Rd., Los Angeles 22, Calif.
1—2

•**ALLIS-CHALMERS MFG. CO.,** 975 So. 70th St., Milwaukee 1, Wis.
1

ALPHA TANK & SHEET METAL MFG. CO., 5001 S. 38th St., St. Louis 16, Mo.
2

AMERICAN AIR FILTER CO., INC., 215 Central Ave., Louisville 8, Ky.
4—5

AMERICAN BLOWER CORP., Box 58 Roosevelt Annex, Detroit 32, Mich.
2

AMERICAN WHEELABRATOR & EQUIPMENT CORP., 439 S. Byrkit St., Mishawaka, Ind.
1

•**BARBER-GREENE CO.,** 631 W. Park Ave., Aurora, Ill.
2—5

THE C. O. BARTLETT AND SNOW CO., 6200 Harvard Ave., Cleveland 5, Ohio
2—4

BEAUMONT BIRCH CO., 1512 Race St., Philadelphia 2, Pa.
2—4

BUELL ENGINEERING CO., INC., 70 Pine St., New York 5, N. Y.
2—3

BUFFALO FORGE CO., 490 Broadway, Buffalo 5, N. Y.

L. BURMEISTER CO., 4539 W. Mitchell St., Milwaukee 14, Wis.

BY-PRODUCTS RECOVERIES, INC., 90 West St., New York 6, N. Y.

THE DAY COMPANY, 810 Third Ave., N. E., Mpls. 13, Minn.

FEDERAL CLASSIFIER SYSTEMS, INC., 127 N. Dearborn, Chicago 2, Ill.
1—2

•**IOWA MFG. CO.,** 916 16th St. N.E., Cedar Rapids, Iowa
2—5

THE KIRK & BLUM MFG. CO., 3120 Forrer Ave., Cincinnati 9, Ohio
2—5

KOPPERS CO., INC., Koppers Bldg., Pittsburgh 19, Pa.
3

THE MACLEOD CO., 2232-40 Bogen St., Cincinnati 22, Ohio
1

JAMES H. MARKLEY, 80 Snyder Road, Ramsey, N. J.
1

THE NORTHERN BLOWER CO., 6408 Barberton Ave., Cleveland 2, Ohio
1—2—4—5

OMEGA MACHINE CO., 345 Harris Ave., Providence, R. I.
1

PANGBORN CORP., Hagerstown, Md.
1—2—5

THE PATTERSON FOUNDRY & MACHINE CO., 1250 St. George St., East Liverpool, Ohio
2

•**PIONEER ENG. WORKS, INC.,** 1515 Central Ave., Minneapolis 13, Minn.
2

PULVERIZING MACHINERY CO., Chatham Road, Summit, N. J.
1

RESEARCH CORP., 405 Lexington Ave., New York 17, N. Y.
3

SCHMIEG INDUSTRIES, INC., 308 Piquette, Detroit 2, Mich.
2—4

CLAUDE B. SCHNEIBLE CO., 2827 25th St., Detroit 16, Mich.
4—

SIMPLICITY SYSTEM CO., Riverside Dr., Chattanooga 6, Tenn.
2

•**THE W. W. SLY MFG. CO.,** 4700 Train Ave., Cleveland 2, Ohio
1

U. S. HOFFMAN MACHINERY CORP., 105 Fourth Ave., New York 3, N. Y.
1—5

WESTERN PRECIPITATION CORP., 1016 West Ninth St., Los Angeles 15, Calif.
1—2—3

WHITING CORP., 15693 Lathrop Ave., Harvey, Ill.
1

•**WILLIAMS PATENT CRUSHER & PULV. CO.,** 800 St. Louis Ave., St. Louis 6, Mo.
2

DUST COLLECTORS, Rock Drill

AMERICAN AIR FILTER CO., INC., 215 Central Ave., Louisville 8, Ky.

JAMES H. MARKLEY, 80 Snyder Road, Ramsey, N. J.

THE NORTHERN BLOWER CO., 6408 Barkerton Ave., Cleveland 2, Ohio

THE SPENCER TURBINE CO., 486 New Park Ave., Hartford 6, Conn.

DUST SAMPLING AND ANALYZING EQUIPMENT

MINNEAPOLIS - HONEYWELL REGULATOR CO., BROWN INSTRUMENTS DIV., Wayne & Roberts Aves., Philadelphia 44, Pa.

WILLSON PRODUCTS, INC., 248 Washington St., Reading, Pa.

DYNAMITE AND BLASTING EXPLOSIVES (see Explosives and Dynamite)

E

EARTH MOVING HAULAGE EQUIPMENT, Self Loading

ALLIS-CHALMERS MFG. CO., 975 S. 70th St., Milwaukee 1, Wis.

•**ALLIS-CHALMERS MFG. CO., TRACTOR DIVISION,** P. O. Box 512, Milwaukee 1, Wis.

•**BUCYRUS-ERIE CO.,** South Milwaukee, Wis.

•**CATERPILLAR TRACTOR CO.,** Peoria 8, Ill.

THE EIMCO CORP., P. O. Box 300, Salt Lake City 8, Utah

•**THE EUCLID ROAD MCHNRY. CO.,** 1361 Chardon Road, Cleveland 17, Ohio

THE HEIL CO., 3000 W. Montana St., Milwaukee 1, Wis.

HENNEUSE ENGINEERING CO., Marion, Ohio

THE FRANK G. HOUGH CO., Sunnyside Ave., Libertyville, Ill.

HYSTER COMPANY, 2918 N. E. Clackamas St., Portland 8, Ore.

LAPLANT-CHOATE MFG. CO., INC., 2920 1st Ave. N.E., Cedar Rapids, Iowa

•**R. G. LeTOURNEAU, INC.,** 2301 N. Adams St., Peoria, Ill.

LULL MFG. CO., 3612 E. 44th St., Minneapolis 6, Minn.

MIXER MOBILE MANUFACTURERS, 6855 N. E. Halsey St., P.O. Box 5108, Portland 16, Oregon

M-R-S MANUFACTURING CO., P.O. Box 336, Flora, Miss.

TRACTOMOTIVE CORP., County Line Road, Deerfield, Ill.

WOOLDRIDGE MFG. CO., Sunnyvale, Calif.

ECONOMIZERS, Waste Heat (see Boilers, Waste Heat)

ELECTRIC MOTORS

•**ALLIS-CHALMERS MFG. CO.,** 975 So. 70th St., Milwaukee 1, Wis.

B. F. M. INDUSTRIES, INC., 2124 Mill Ave., Brooklyn 34, N. Y.

CENTURY ELECTRIC CO., 1806 Pine St., St. Louis 3, Mo.

CROCKER-WHEELER ELECTRIC MFG. CO., DIV. OF ELLIOTT CO., Ampere, N. J.

DYNAMATIC CORP., 3307 14th Ave., Kenosha, Wis.

ELECTRIC MACHINERY MFG. CO., 1331 Tyler St. N.E., Minneapolis 14, Minn.

FAIRBANKS MORSE & CO., 600 S. Michigan Ave., Chicago 5, Ill.

•**FLEMING MFG. CO.,** 4985 Tyler Ave., St. Louis 9, Mo.

•**GENERAL ELECTRIC CO.,** 1 River Road, Schenectady 5, N. Y.

GREENVILLE MFG. WORKS, 112½ W. 4th St., Greenville, Ohio

C. W. KALBFUS, ELLIOTT CO., INC., Jeannette, Pa.

THE LOUIS ALLIS CO., 427 E. Stewart St., Milwaukee 7, Wis.

•**M & M ENGINEERING CORP.,** 3928 Millersville Dr., Indianapolis 5, Ind.

RELIANCE ELECTRIC & ENGINEERING CO., 1088 Ivanhoe Rd., Cleveland 10, Ohio

•**STERLING ELECTRIC MOTORS, INC.,** 5401 Anaheim-Telegraph Road, Los Angeles 22, Calif.

U. S. ELECTRICAL MOTORS INC., 200 E. Slauson Ave., Los Angeles 54, Calif.

WAGNER ELECTRIC CORP., 6400 Plymouth Ave., St. Louis 14, Mo.

WESTINGHOUSE ELECTRIC CO., First Nat'l Bank Bldg., Pittsburgh, Pa.

ELECTRIC SWITCH GEAR

•**ALLIS-CHALMERS MFG. CO.,** 975 So. 70th St., Milwaukee 1, Wis.

ELECTRIC MACHINERY MFG. CO., 1331 Tyler St. N.E., Minneapolis 14, Minn.

•**GENERAL ELECTRIC CO.,** 1 River Road, Schenectady 5, N. Y.

INTERNATIONAL DIESEL ELECTRIC CO., INC., 13-02 44th Ave., Long Island City 1, N. Y.

I-T-E- CIRCUIT BREAKER CO., 19th and Hamilton St., Philadelphia 30, Pa.

WESTINGHOUSE ELECTRIC CO., First Nat'l Bank Bldg., Pittsburgh, Pa.

ELECTRIC TRANSFORMERS

•**ALLIS-CHALMERS MFG. CO.,** 975 So. 70th St., Milwaukee 1, Wis.

•**GENERAL ELECTRIC CO.,** 1 River Road, Schenectady 5, N. Y.

WAGNER ELECTRIC CORP., 6400 Plymouth Ave., St. Louis 14, Mo.

WESTINGHOUSE ELECTRIC CO., First Nat'l Bank Bldg., Pittsburgh, Pa.

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ALBERT & J. M. ANDERSON MFG. CO., 289-305 A St., Boston 10, Mass.

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WESTINGHOUSE ELECTRIC CO., First Nat'l Bank Bldg., Pittsburgh, Pa.

ELECTRODES, WELDING (see Welding Rods and Electrodes)

ELEVATORS, Chain or Belt & Bucket

ACME ROAD MACHINERY CO., East Main St., Frankfort, N. Y.

ALPHA TANK & SHEET METAL MFG. CO., 5001 S. 38th St., St. Louis 16, Mo.

•**AMERICAN MANGANESE STEEL DIV., AMERICAN BRAKE SHOE CO.,** 401 E. 14th St., Chicago Heights, Ill.

• A dot before name indicates advertiser in this issue. See advertiser index.

DIRECTORY

ANDERSON ENGINEERING CO., 237 Bent St., Cambridge 41, Mass.

•**BARBER-GREENE CO.,** 631 W. Park Ave., Aurora, Ill.

THE C. O. BARTLETT AND SNOW CO., 6200 Harvard Ave., Cleveland 5, Ohio

•**BAUGHMAN MFG. CO., INC.,** 1000 Shipman, Jerseyville, Ill.

BEAUMONT BIRCH CO., 1512 Race St., Philadelphia 2, Pa.

BODINSON MFG. CO., 2401 Bayshore Blvd., San Francisco 24, Calif.

BONDED SCALE & MACHINE CO., 41 Bellview Ave., Columbus 7, Ohio

•**BUTLER BIN CO.,** Box 407, Waukesha, Wis.

•**CHAIN BELT CO.,** 1600 W. Bruce St., Milwaukee 4, Wis.

CHAMPION LINE MACHINERY CO., 95 Schuyler Ave., N. Arlington, N. J.

CONSTRUCTION MACHINERY CO'S., Glenwood & Vinton Sts., Waterloo, Iowa

•**CONTINENTAL GIN CO.,** 4500 5th Ave. S, Birmingham, Ala.

THE CONVEYOR CO., 3260 East Slauson Ave., Los Angeles 11, Calif.

•**DIAMOND IRON WORKS, INC.,** 1728 2nd St., N, Mpls. 11, Minn.

EAGLE CRUSHER CO., INC., 900 Harding Way E., Galion, Ohio

•**THE J. B. EHRSAM & SONS MFG. CO.,** Enterprise, Kans.

ERIE STEEL CONST. CO., Giest Road & N. P. R. R., Erie, Pa.

•**FLEMING MFG. CO.,** 4985 Fyler Ave., St. Louis, Mo.

GENERAL ENGINES CO., 307 Hunter St., Gloucester, N. J.

GODFREY CONVEYOR CO., 13th & Wolf Ave., Elkhart, Ind.

GEORGE HAISS MFG. CO., Park Ave. & 143rd St., New York 51, N. Y.

GREENVILLE MFG. WORKS, 1121½ W. 4th, Greenville, Ohio

•**GRUENDLER CRUSHER & PULVERIZER CO.,** 2920 N. Market St., St. Louis 6, Mo.

HARDY SCALES CO., 5701 So. Atlantic Blvd., Maywood, Calif.

THE HELTZEL STEEL FORM AND IRON CO., 1750 Thomas Road, Warren, Ohio

•**IOWA MFG. CO.,** 916 16th St. N.E., Cedar Rapids, Iowa

THE JEFFREY MFG. CO., 935 N. 4th St., Columbus 16, Ohio

•**THE C. S. JOHNSON CO.,** P.O. Box 71, Champaign, Ill.

JOHNSON & HOEHLER, INC., P.O. Box 102, Lansdowne, Pa.

•**KENNEDY VAN SAUN MFG. & ENG. CORP.,** 2 Park Ave., New York 16, N. Y.

•**THE KENT MACHINE CO.,** 113 E. Portage Trail, Cuyahoga Falls, Ohio

FRANK A. KREMSER & SONS, INC., 3435-45 N. 5th St., Philadelphia 40, Pa.

LANDIS STEEL CO., 116 W. A St., Picher, Okla.

•**LINK-BELT CO.,** 300 W. Pershing Road, Chicago 9, Ill.

•**LIPPMANN ENGINEERING WORKS,** 4603 W. Mitchell St., Milwaukee 14, Wis.

E. F. MARSH ENG. CO., 4324 W. Clayton Ave., St. Louis 10, Mo.

McNALLY PITTSBURGH MFG. CORP., Pittsburg, Kans.

LESLIE C. MILLER SUPPLY INC., P. O. Box 7, Bedford, Ohio

•**McLANAHAN AND STONE CORP.,** Hollidaysburg, Pa.

NOBLE CO., 1860 Seventh St., Oakland 20, Calif.

O. K. CLUTCH & MCHNRY. CO., Florence St., Columbia, Pa.

•**PETTIBONE MULLIKEN CORP., IMPACT MASTER DIV.,** 4700 W. Division St., Chicago 51, Ill.

PHILADELPHIA BELTING CO., 6th & Spring Garden Sts., Philadelphia 23, Pa.

•**PRASCHAK MACHINE CO.,** Marshfield, Wis.

•**REPUBLIC RUBBER DIV., LEE RUBBER & TIRE CORP.,** Albert Street, Youngstown 1, Ohio

ROGERS IRON WORKS CO., 11th & Pearl Sts., Joplin, Mo.

•**SMITH ENGINEERING WORKS,** 532 E. Capitol Dr., Milwaukee 12, Wis.

SPROUT, WALDRON & CO., INC., Muncy, Pa.

STEPHENS-ADAMSON MFG. CO., 7 Ridgeway Ave., Aurora, Ill.

STRAUB MFG. CO., 456 Chestnut, Oakland, Calif.

STURTEVANT MILL CO., 102 Clayton St., Boston 22, Mass.

•**SuPREMIX, INC.,** 401 Grace St., Adrian, Mich.

TRIANGLE ENGINEERING CO., 2848 W. 26th St., Chicago 23, Ill.

TROWBRIDGE CONVEYOR CO., 860 Van Houten Ave., Clifton, N. J.

UNITED IRON WORKS CO., 108 No. Locust, Pittsburg, Kans.

•**UNIVERSAL ENGINEERING CORP.,** 625 C Ave. N.W., Cedar Rapids, Iowa

UNIVERSAL ROAD MACHINERY CO., 27 Emerick St., Kingston, N. Y.

WEBSTER MFG. INC., Tiffin 16, Ohio

•**WILLIAMS PATENT CRUSHER & PULV. CO.,** 800 St. Louis Ave., St. Louis 6, Mo.

WIS. FOUNDRY & MACHINE CO., 623 E. Main St., Madison, Wis.

WITTEMANN MACHINERY CO., Paynters Road, Farmingdale, N. J.

ELEVATORS, Bulk Cement

ANDERSON ENGINEERING CO., 237 Bent St., Cambridge 41, Mass.

•**BAUGHMAN MFG. CO., INC.,** 1000 Shipman Rd., Jerseyville, Ill.

BEAUMONT-BIRCH CO., 1512 Race St., Philadelphia, Penna.

•**BLAW-KNOX DIV., BLAW-KNOX CO.,** P.O. Box 1198, Pittsburgh 30, Pa.

BODINSON MFG. CO., 2401 Bayshore Blvd., San Francisco 24, Calif.

•**BUTLER BIN CO.,** Box 407, Waukesha, Wis.

•**CHAIN BELT CO.,** 1600 W. Bruce St., Milwaukee 4, Wis.

CHICAGO STEEL FOUNDRY CO., 3720 S. Kedzie Ave., Chicago 32, Ill.

CONSTRUCTION MACHINERY CO'S., Glenwood & Vinton Sts., Waterloo, Iowa

•**CONTINENTAL GIN CO.,** 4500 5th Ave. S., Birmingham, Ala.

THE CONVEYOR CO., 3260 East Slauson Ave., Los Angeles 11, Calif.

CLYDE IRON WORKS, INC., P.O. Box 370, Duluth 1, Minn.

•**THE J. B. EHRSAM & SONS MFG. CO.,** Enterprise, Kans.

ERIE STEEL CONST. CO., Giest Road & N. P. R. R., Erie, Pa.

•**FLEMING MFG. CO.,** 4985 Fyler Ave., St. Louis 9, Mo.

GREENVILLE MFG. WORKS, 1121½ W. 4th, Greenville, Ohio

HARDY SCALES CO., 5701 So. Atlantic Blvd., Maywood, Calif.

THE HELTZEL STEEL FORM AND IRON CO., 1750 Thomas Road, Warren, Ohio

•**ROBINS CONVEYORS DIV., HEWITT-ROBINS INC.,** 270 Passaic Ave., Passaic, N. J.

THE JEFFREY MFG. CO., 935 N. 4th St., Columbus 16, Ohio

•**THE C. S. JOHNSON CO.,** P.O. Box 71, Champaign, Ill.

•**KENNEDY VAN SAUN MFG. & ENG. CORP.,** 2 Park Ave., New York 16, N. Y.

•**THE KENT MACHINE CO.,** 113 E. Portage Trail, Cuyahoga Falls, Ohio

FRANK A. KREMSER & SONS INC., 3435-45 N. 5th St., Philadelphia 40, Pa.

LANDIS STEEL CO., 116 W. A St., Picher, Okla.

•**LIPPMANN ENGINEERING WORKS,** 4603 W. Mitchell St., Milwaukee 14, Wis.

•**MULTIPLEX MACHINERY CORP.,** Elmore, Ohio

NORTHERN CONVEYOR CO., 327 W. State St., Janesville, Wis.

NOBLE CO., 1860 Seventh St., Oakland 20, Calif.

STEPHENS-ADAMSON MFG. CO., 7 Ridgeway Ave., Aurora, Ill.

STURTEVANT MILL CO., 102 Clayton St., Boston 22, Mass.

•**SuPREMIX, INC.,** 401 Grace, Adrian, Mich.

TRIANGLE ENGINEERING CO., 2848 W. 26th St., Chicago 23, Ill.

WIS. FOUNDRY & MACHINE CO., 623 E. Main, Madison, Wis.

ELEVATORS, Portable

(See Loaders, Truck)

ENGINEERING SERVICE, Consulting and Designing

ABBE ENGINEERING CO., 50 Church St., New York 7, N. Y.

ALLEN CONE & MACHINERY CORP., 120 Broadway, New York 5, N. Y.

ARNOLD & WEIGEL DIV., TOLEDO ENGINEERING CO., INC., 958 Wall St., Toledo 6, Ohio

BODINSON MFG. CO., 2401 Bayshore Blvd., San Francisco 24, Calif.

CHICAGO STEEL FOUNDRY CO., 3720 So. Kedzie Ave., Chicago 32, Ill.

H. C. McCALL, CONCRETE ENG. SERVICE CO., 35 Berkley Place, Columbus 1, Ohio

THE CONVEYOR CO., 3260 East Slauson Ave., Los Angeles 11, Calif.

•**DENVER EQUIPMENT CO.,** 1410 Seventeenth St., Denver 17, Colo.

•**THE DORR CO., ENGINEERS,** Barry Place, Stamford, Conn.

•**EAGLE IRON WORKS,** 137 Holcomb Ave., Des Moines 4, Iowa

THE H. K. FERGUSON CO., 1781 E. 11th St., Cleveland 14, Ohio

•**FLEMING MFG. CO.,** 4985 Tyler Ave., St. Louis 9, Mo.

THE GATES RUBBER CO., 999 S. Broadway, Denver 17, Colo.

GREENVILLE MFG. WORKS, 1121½ W. 4th, Greenville, Ohio

•**HAMMERMILLS, INC., DIV. PETTIBONE MULLIKEN CORP.,** 4710 W. Division, Chicago 51, Ill.

E. LEE HEIDENREICH, JR., 67 Second St., Newburgh, N. Y.

ROBINS CONVEYORS DIV., HEWITT-ROBINS INC., 270 Passaic Ave., Passaic, N. J.

•**KENNEDY VAN SAUN MFG. & ENG. CORP.,** 2 Park Ave., New York 16, N. Y.

KOPPERS CO., INC., Koppers Bldg., Pittsburgh 19, Pa.

HERBERT LAUER, Cement Plant Engineer, 912 W. Harvard, Orlando, Fla.

LIME INDUSTRY MANAGEMENT & ENGINEERING, Hershey, Pa.

LUKENS STEEL CO., 521 Lukens Bldg., Coatesville, Pa.

MACDONALD ENGINEERING CO., 188 West Randolph St., Chicago 1, Ill.

E. F. MARSH ENG. CO., 4324 W. Clayton Ave., St. Louis 10, Mo.

•**M & M ENGINEERING CORP.,** 3928 Millersville Dr., Indianapolis 5, Ind.

MECKUM ENGINEERING, INC., Dayton Rd., Ottawa, Ill.

NICHOLS ENGINEERING & RESEARCH CORP., 70 Pine St., New York 5, N. Y.

NOVERA INC., 420 Lexington Ave., New York 17, N. Y.

•**OSWALT ENGINEERING SERVICE CORP.,** 1335 Circle Ave., Forest Park, Ill.

OVERSTROM & SONS, 2213 W. Mission Road, Alhambra, Calif.

THE PATTERSON FOUNDRY & MACHINE CO., 1250 St. George St., East Liverpool, Ohio

POSEY IRON WORKS, INC., INDUSTRIAL HEATING DIVN., 560 S. Prince St., Lancaster, Pa.

WM. E. ROBINSON & CO., 3307 Spring Garden St., Philadelphia 4, Pa.

THE RUCKER CO., 4228 Hollis St., Oakland 8, Calif.

SEPARATION PROCESS CO., Fuller Bldg., Catasauqua, Pa.

THE SINK & FLOAT CORP., Empire State Bldg., New York 1, N. Y.

•**F. L. SMIDTH & CO.,** 11 W. 42nd St., New York 18, N. Y.

SOUTHWESTERN ENGINEERING CO., 4800 Santa Fe Ave., Los Angeles 58, Cal.

•**STEARNS MFG. CO.,** 600 E. Beecher St., Adrian, Mich.

STEPHENS-ADAMSON MFG. CO., 7 Ridgeway Ave., Aurora, Ill.

STURTEVANT MILL CO., 102 Clayton St., Boston 22, Mass.

VIBRATION ENGINEERING CO., 131 Wyoming St., Hazleton, Pa.

HUGO W. WEIMER CO., 2412 W. State St., Milwaukee 3, Wisc.

•**WESTERN MACHINERY CO.,** 760-766 Folsom St., San Francisco 7, Calif.

•**WILLIAMS PATENT CRUSHER & PULV. CO., INC.,** 800 St. Louis Ave., St. Louis 6, Mo.

ENGINES, Diesel

(see Diesel Engines)

ENGINES

1. Gasoline
2. Kerosene
3. Marine
4. Natural Gas or L. P. G.

•**ALLIS-CHALMERS MFG. CO.,** 975 So. 70th St., Milwaukee 1, Wis.
1—2—3

•**ALLIS-CHALMERS MFG. CO., TRACTOR DIVISION,** P. O. Box 512, Milwaukee 1, Wis.
1—2—3—4

B. F. M. INDUSTRIES, INC., 2124 Mill Ave., Brooklyn 34, N. Y.
3

BRIGGS & STRATTON CORP., 2711 N. 13th St., Milwaukee 1, Wis.
1

THE BUDA COMPANY, 154th & Commercial, Harvey, Ill.
1—3—4

BUFFALO GASOLINE ENGINE SERVICE, 175 Great Arrow Ave., Buffalo 7, N. Y.
1—4

• A dot before name indicates advertiser in this issue. See advertiser index.

DIRECTORY

J. I. CASE CO., 700 State St., Racine, Wis.
1—4

●**CATERPILLAR TRACTOR CO.**, Peoria 8, Ill.
3

●**CHRYSLER INDUSTRIAL ENGINE DIV.**, 12,200 E. Jefferson St., Detroit 31, Mich.
1

CONCRETE TRANSPORT MIXER CO., 4985 Fyler Ave., St. Louis 9, Mo.
1

CONTINENTAL MOTORS CORP., 20 S. Market St., Muskegon, Mich.
1—2—4

THE COOPER-BESSEMER CORP., Mount Vernon, Ohio
3—4

CUMMINS ENGINE CO., INC., Fifth & Union Sts., Columbus, Ind.
4

●**DETROIT DIESEL ENGINE DIV., GENERAL MOTORS CORP.**, 13400 W. Outer Drive, Detroit 28, Mich.
3

ENTERPRISE ENGINE & MACHINERY CO., 18th and Florida Sts., San Francisco 10, Calif.
3—4

FAIRBANKS MORSE & CO., 600 S. Michigan Ave., Chicago 5, Ill.
1—2—3—4

●**FLEMING MFG. CO.**, 4985 Fyler Ave., St. Louis, Mo.
1

GLADDEN PRODUCTS CORP., 635 W. Colorado Blvd., Glendale 4, Calif.
1—2

HERCULES MOTORS CORP., 101 Eleventh St. S.E., Canton 2, Ohio
1—2—3—4

INGERSOLL-RAND CO., 11 Broadway, New York 4, N. Y.
3—4

INTERNATIONAL HARVESTER CO., 180 N. Michigan Ave., Chicago 1, Ill.
1—2—4

●**LEROI CO.**, 1706 So. 68th St., Milwaukee, Wis.
1—4

LORIMER ENGINE DIV. ATLAS IMPERIAL DIESEL ENGINE CO., 1000 19th Ave., Oakland 6, Calif.
3—4

●**MACK MFG. CORP.**, 350 Fifth Ave., New York 1, N. Y.
1

MINNEAPOLIS-MOLINE CO., P. O. Box 1050, Minneapolis 1, Minn.
1—2—4

MURPHY DIESEL CO., 5317 W. Burnham St., Milwaukee 14, Wis.
3—4

●**NORDBERG MFG. CO.**, 3073 So. Chase Ave., Milwaukee 7, Wis.
1—3—4

NOVO ENGINE CO., 702 Porter St., Lansing 5, Mich.
1—2

D. W. ONAN & SONS INC., University Ave., S.E., at 25th, Minneapolis 14, Minn.
1—2—4

SHEPPARD DIESELS, Philadelphia St., Hanover, Pa.
3

WAUKESHA MOTOR CO., West St. Paul Ave., Waukesha, Wis.
1—3—4

WISCONSIN MOTOR CORP., 1910 So. 53rd St., Milwaukee 46, Wis.
1—2

WITTE ENGINE WORKS, DIV. OF OIL WELL SUPPLY CO., 1600 Oakland Ave., Kansas City 3, Mo.
1—2—3—4

WORTHINGTON PUMP & MACHINERY CORP., Worthington Ave., Harrison, N. J.
3—4

ENTRAINED AIR INDICATORS

AUTOLENTE LUBRICANTS CO., PROTEX DIVN., 1331 W. Evans Ave., Denver 9, Colo.

HUMBOLDT MFG. CO., 2014 N. Whipple St., Chicago 47, Ill.

EXCAVATORS, Cableway Dragline (see Cable Excavators)

EXCAVATORS, Clamshell (see Cranes)

EXCAVATORS, Scraper (see Cable Excavators)

EXCAVATORS, Tower (see Cableways)

EXHAUSTERS

AMERICAN BLOWER CORP., Detroit 32, Mich.

C. L. AMMERMAN CO., 3719 Third St. N.E., Minneapolis 21, Minn.

BUFFALO FORGE CO., 490 Broadway, Buffalo 5, N. Y.

CLARAGE FAN CO., 619 Porter St., Kalamazoo 16, Mich.

THE DAY COMPANY, 810 Third Ave., N. E., Minneapolis 13, Minn.

DE LAVAL STEAM TURBINE CO., Trenton 2, N. J.

THE NORTHERN BLOWER CO., 6408 Barberton Ave., Cleveland 2, Ohio

U. S. HOFFMAN MACHINERY CORP., 105 Fourth Ave., New York 3, N. Y.

WORTHINGTON PUMP & MACHINERY CORP., Worthington Ave., Harrison, N. J.

EXPLOSIVES & DYNAMITE

●**AMERICAN CYANAMID CO.**, Explosives Dept., 30 Rockefeller Plaza, New York 20, N. Y.

ATLAS POWDER CO., Delaware Trust Bldg., Wilmington, Del.

E. I. du PONT de NEMOURS & CO., INC., Wilmington 98, Del.

THE ENSIGN-BICKFORD CO., S Hopmeadow St., Simsbury, Conn.

THE EQUITABLE POWDER MFG. CO., East Alton, Ill.

●**HERCULES POWDER CO.**, 946 King St., Wilmington, Del.

ILLINOIS POWDER MFG. CO., 730 Pierce Bldg., St. Louis 2, Mo.

THE KING POWDER CO., INC., 1703—1st National Bank Bldg., Cincinnati 2, Ohio

MILLER MANUFACTURING CO., Mills Bldg., P. O. Dr. 666, El Paso, Tex.

TROJAN POWDER CO., 17 N. Seventh St., Allentown, Pa.

F

FANS AND BLOWERS

AIRFAN ENGINEERING CO., 7401 Ana Telegraph Rd., Los Angeles 22, Calif.

AMERICAN BLOWER CORP., Box 58, Roosevelt Annex, Detroit 32, Mich.

C. L. AMMERMAN CO., 3719 Third St., N.E., Minneapolis 21, Minn.

BUFFALO FORGE CO., 490 Broadway, Buffalo 5, N. Y.

CLARAGE FAN CO., 619 Porter St., Kalamazoo 16, Mich.

COPPUS ENGINEERING CORP., 344 Park Ave., Worcester 2, Mass.

DE LAVAL STEAM TURBINE CO., Trenton 2, N. J.

THE DeVILBISS CO., 300 Phillips Ave., Toledo 1, Ohio

●**DIAMOND IRON WORKS, INC.**, 1728 2nd St., N., Minneapolis 11, Minn.

●**GENERAL ELECTRIC CO.** 1 River Rd., Schenectady 5, N. Y.

HOMELITE CORP., Riverdale Ave., Port Chester, N. Y.

THE JEFFREY MFG. CO., 935 N. 4th St., Columbus 16, Ohio

JOHNSTON MFG. CO., 2825 E. Hennepin Ave., Minneapolis 13, Minn.

●**JOY MANUFACTURING CO.**, Henry W. Oliver Bldg., Pittsburgh 22, Pa.

●**KENNEDY VAN SAUN MFG. & ENG. CORP.**, 2 Park Ave., New York 16, N. Y.

KOPPERS CO., INC., Koppers Bldg., Pittsburgh 19, Pa.

MAHR MFG. CO., DIV. DIAMOND IRON WKS., 1728 2nd St., No., Minneapolis 11, Minn.

THE NORTHERN BLOWER CO., 6408 Barberton Ave., Cleveland 2, Ohio

SINTERING MACHINERY CORP., Netcong, N. J.

THE SPENCER TURBINE CO., 486 New Park Ave., Hartford 6, Conn.

FASTENERS, Belt (see Belt Fasteners)

FEEDERS, Concrete

●**THE KENT MACHINE CO.**, 113 E. Portage Trail, Cuyahoga Falls, Ohio

MERRICK SCALE MFG. CO., 180 Autumn St., Passaic, N. J.

LESLIE C. MILLER SUPPLY INC., P. O. Box 7, Bedford, Ohio

●**ROBINS CONVEYORS DIV., HEWITT-ROBINS INC.**, 270 Passaic Ave., Passaic, N. J.

FEEDERS, Flue Dust

THE BONNOT CO., 722 Mulberry S.E., Canton 2, Ohio

MANITOWOC ENGINEERING WORKS, Manitowoc, Wis.

MERRICK SCALE MFG. CO., 180 Autumn St., Passaic, N. J.

●**F. L. SMIDTH & CO.**, 11 W. 42nd St., New York 18, N. Y.

FEEDERS

1. **Apron**
2. **Proportioning**
3. **Reciprocating**
4. **Screw**
5. **Table**
6. **Weight Proportioning**
7. **Rotary**
8. **Chain**
9. **Scale Conveyor**

ACME ROAD MACHINERY CO., East Main St., Frankfort, N. Y.
1—3

●**ALLIS-CHALMERS MFG. CO.**, 975 So. 70th St., Milwaukee 1, Wis.
1—4—5

AMERICAN MANGANESE STEEL DIV. OF AMERICAN BRAKE SHOE CO., 377 E. 14th St., Chicago Heights, Ill.
1

ARNOLD & WEIGEL DIV., TOLEDO ENGINEERING CO., INC., 958 Wall St., Toledo 6, Ohio
7

●**AUSTIN-WESTERN CO.**, 601 N. Farnsworth Ave., Aurora, Ill.
1—3

●**BARBER-GREENE CO.**, 631 W. Park Ave., Aurora, Ill.
1—3

THE C. O. BARTLETT AND SNOW CO., 6200 Harvard Ave., Cleveland 5, Ohio
1—3—4—5

●**BAUGHMAN MFG. CO., INC.**, 1000 Shipman, Jerseyville, Ill.
4

BEAUMONT BIRCH CO., 1512 Race St., Philadelphia 2, Pa.
1—3—4—7

BODINSON MFG. CO., 2401 Bayshore Blvd., San Francisco 24, Calif.
1—3—4

BONDED SCALE & MACHINE CO., 41 Bellview Ave., Columbus 7, Ohio
3

THE BONNOT CO., 722 Mulberry S.E., Canton 2, Ohio
1—3—4—7

BUILDERS-PROVIDENCE, INC., 345 Harris Ave., Providence 1, R. I.
9

L. BURMEISTER CO., 4535 W. Mitchell St., Milwaukee 14, Wis.
4

●**BUTLER BIN CO.**, Box 407, Waukesha, Wis.
4

●**CHAIN BELT CO.**, 1600 W. Bruce St., Milwaukee 4, Wis.
1—8

CHICAGO STEEL FOUNDRY CO., 3720 E. Kedzie Ave., Chicago 32, Ill.
4—8

COLORADO IRON WORKS CO., 1624 17th St., Denver 2, Colo.
4

CONCRETE TRANSPORT MIXER CO., 4985 Fyler Ave., St. Louis 9, Mo.
4

●**CONTINENTAL GIN CO.**, 4500 5th Ave. S., Birmingham, Ala.
1—2—3—4—5—6—7—8—9

THE CONVEYOR CO., 3260 East Slauson Ave., Los Angeles 11, Calif.
1—2—3—4—5—6

THE DEISTER CONCENTRATOR CO., 935 Glascow, Fort Wayne 1, Ind.
2—7

●**DEISTER MACHINE CO.**, 1933 E. Wayne St., Fort Wayne 4, Ind.
7

●**DENVER EQUIPMENT CO.**, 1410 Seventeenth St., Denver 17, Colo.
1—8

●**DIAMOND IRON WORKS, INC.**, 1728 2nd St. No., Minneapolis 11, Minn.
1—3

●**THE J. B. EHRSAM & SONS MFG. CO.**, Enterprise, Kans.
1—2—4

FEDERAL CLASSIFIER SYSTEMS, INC., 127 N. Dearborn St., Chicago 2, Ill.
4—7

●**FLEMING MFG. CO.**, 4985 Fyler Ave., St. Louis 9, Mo.
4

●**FULLER COMPANY**, Fuller Bldg., Catasauqua, Pa.
7

THE GALIGHER COMPANY, 545 W. 8th South, Salt Lake City, Utah
2

GODFREY CONVEYOR CO., 13th & Wolf Ave., Elkhart, Ind.
1

GREENVILLE MFG. WORKS, 112½ W. 4th St., Greenville, Ohio
1—3

●**GRUENDLER CRUSHER & PULVERIZER CO.**, 2920 N. Market St., St. Louis 6, Mo.
1—3—7—8

GEORGE HAISS MFG. CO., Park Ave. & 143rd St., New York 51, N. Y.
1—3

● A dot before name indicates advertiser in this issue. See advertiser index.

DIRECTORY

●**HAMMERMILLS, INC., DIV. OF PETTIBONE MULLIKEN CORP.,** 4710 W. Division St., Chicago 51, Ill.
1—3

●**HARDINGE CO., INC.,** 240 Arch St., York, Pa.
4—6—7

THE HELTZEL STEEL FORM AND IRON CO., 1750 Thomas Road, Warren, Ohio
1—3—4

●**ROBINS CONVEYORS DIV., HEWITT-ROBINS INC.,** 270 Passaic Ave., Passaic, N. J.
1—3

THE HOWE SCALE CO., Rutland, Vt.
2—9

●**IOWA MFG. CO.,** 916 16th St. N.E., Cedar Rapids, Iowa
1—2—3

THE JEFFREY MFG. CO., 935 N. 4th St., Columbus 16, Ohio
1—2—3—4—6

●**KENNEDY VAN SAUN MFG. & ENG. CORP.,** 2 Park Ave., New York 16, N. Y.
1—2—3—4—5—6

KENSINGTON STEEL CO., 505 Kensington St., Chicago 28, Ill.
1

●**THE KENT MACHINE CO.,** 113 E. Portage Trail, Cuyahoga Falls, Ohio
3

KORB-PETTIT WIRE FABRICS & IRON WORKS, INC., 1505-15 N. Mascher St., Philadelphia 22, Pa.
1

FRANK A. KREMSER & SONS, INC., 3435-45 N. 5th St., Philadelphia 40, Pa.
1—3

●**LINK-BELT CO.,** 300 W. Pershing Road, Chicago 9, Ill.
1—2—3—4—5—7—8—9

●**LIPPMANN ENGINEERING WORKS,** 4603 W. Mitchell St., Milwaukee 14, Wis.
1—2—3—4—5—8

MANGANESE STEEL FORGE CO., Richmond St. & Castor Ave., Philadelphia 34, Pa.
1—4

E. F. MARSH ENG. CO., 4324 W. Clayton Ave., St. Louis 10, Mo.
1—3

●**MERRICK SCALE MFG. CO.,** 180 Autumn St., Passaic, N. J.
6—9

●**McLANAHAN AND STONE CORP.,** Hollidaysburg, Pa.
1—3—4—7—8

NICHOLS ENGINEERING & RESEARCH CORP., 70 Pine St., New York 5, N. Y.
6

●**NORDBERG MFG. CO.,** 3073 So. Chase Ave., Milwaukee 7, Wis.
1

OMEGA MACHINE CO., 345 Harris Ave., Providence 1, R. I.
6

●**PETTIBONE MULLIKEN CORP., IMPACT MASTER DIV.,** 4700 W. Division St., Chicago 51, Ill.
1—3

●**PIONEER ENG. WORKS, INC.,** 1515 Central Ave., Minneapolis 13, Minn.
1—3

POSEY IRON WORKS, INC., INDUSTRIAL HEATING DIVN., 560 S. Prince St., Lancaster, Pa.
7

PRESSED STEEL CAR CO., INC., 25 Broad St., New York 4, N. Y.
4

RICHARDSON SCALE CO., Van Houten Ave., Clifton, N. J.
6—9

WM. E. ROBINSON & CO., 3633 Spring Garden St., Phila. 4, Pa.

ROGERS IRON WORKS CO., 11th & Pearl Sts., Joplin, Mo.
1—3

●**ROSS SCREEN & FEEDER CO.,** 19 Rector St., New York 6, N. Y.
8

SCHAFFER POIDOMETER CO., 2828 Smallman St., Pittsburgh 22, Pa.
6

SIMPLICITY ENGINEERING CO., Durand, Mich.
3

SIMPLICITY SYSTEM CO., Riverside Dr., Chattanooga 6, Tenn.
1

SINTERING MACHINERY CORP., Netcong, N. J.
1—5—9

●**F. L. SMIDTH & CO.,** 11 W. 42nd St., New York 18, N. Y.
1—2—3—4—5—6—7—8

●**SMITH ENGINEERING WORKS,** 532 E. Capitol Dr., Milwaukee 12, Wis.
1—3

SPROUT, WALDRON & CO., INC., Muncy, Pa.
2—4

●**STEARNS MFG. CO.,** 600 E. Beecher St., Adrian, Mich.
2

J. C. STEELE & SONS, INC., North Mulberry, Statesville, N. C.
4

STEPHENS-ADAMSON MFG. CO., 7 Ridgeway Ave., Aurora, Ill.
1—2—3—4—5—7—8

STRAUB MFG. CO., 456 Chestnut St., Oakland 7, Calif.
3—4

●**SYNTRON CO.,** 450 Lexington Ave., Homer City, Pa.
2—3—6

TOLEDO SCALE CO., 1090 Telegraph Rd., Toledo 12, Ohio
9

●**TRAYLOR ENGINEERING & MFG. CO.,** Allentown, Pa.
1—3—5

TRIANGLE ENGINEERING CO., 2848 W. 26th St., Chicago 23, Ill.
1—3

●**UNIVERSAL ENGINEERING CORP.,** 625 C Ave. N. W., Cedar Rapids, Iowa
1—3

UNIVERSAL ROAD MACHINERY CO., 27 Emerick St., Kingston, N. Y.
1—3

VIBRO-PLUS PRODUCTS, INC., 54-11 Queens Blvd., Woodside, L. I., N. Y.

●**WILLIAMS PATENT CRUSHER & PULV. CO.,** 800 St. Louis Ave., St. Louis 6, Mo.
1—3—4

WIS. FOUNDRY & MACHINE CO., 623 E. Main St., Madison, Wis.
1—3

FILTER CLOTH, Slurry Filter

●**THE COLORADO FUEL & IRON CORP.,** Continental Oil Bldg., Denver 2, Colo.

FILTRATION ENGINEERS INC., 155 Oraton St., Newark 4, N. J.

MANGANESE STEEL FORGE CO., Richmond St. & Castor Ave., Philadelphia 34, Pa.

MULTI-METAL WIRE CLOTH CO., INC., 1358 Garrison Ave., New York 18, N. Y.

THE W. S. TYLER CO., 3615 Superior Ave., Cleveland 14, O.

FILTERS, Cement Slurry (see Slurry Filters)

FIRE BRICK, Kiln Liners, etc. (see Refractories)

FLEXIBLE COUPLINGS (see Drives)

FLOORING, Industrial, Iron and Steel

●**BLAW-KNOX DIV. OF BLAW-KNOX CO.,** P.O. Box 1198, Pittsburgh 30, Pa.

●**HENDRICK MFG. CO.,** 47 Dundaff St., Carbondale, Pa.

A. C. HORN CO., INC., 10th St. and 44th Ave., Long Island City 1, N. Y.

INLAND STEEL CO., 38 S. Dearborn, Chicago 3, Ill.

JONES & LAUGHLIN STEEL CORP., Third Ave. & Ross St., Pittsburgh 30, Pa.

KORB-PETTIT WIRE FABRICS & IRON WORKS, INC., 1505-15 N. Mascher St., Philadelphia 22, Pa.

LUKENS STEEL CO., 521 Lukens Bldg., Coatesville, Pa.

THE MASTER BUILDERS CO., 7016 Euclid Ave., Cleveland 3, Ohio

UNITED STATES STEEL CO., Pittsburgh 30, Pa.

FLOORING SYSTEMS, Concrete (see Concrete Specialty Forms)

FLOTATION EQUIPMENT

ALLEN CONE & MACHINERY CORP., 120 Broadway, New York 5, N. Y.

●**DENVER EQUIPMENT CO.,** 1410 Seventeenth St., Denver 17, Colo.

●**DIAMOND IRON WORKS, INC.,** 1728 2nd St., N. Mpls. 11, Minn.

THE GALIGHER COMPANY, 545 W. 8th South, Salt Lake City, Utah

GENERAL AMERICAN TRANSPORTATION CORP., Field Bldg., Room 3105, 135 So. LaSalle St., Chicago 90, Ill.

GREENVILLE MFG. WORKS, 1121½ W. 4th St., Greenville, Ohio

GROCH ENGINEERING CO., 1612 W. 109 Pl., Los Angeles 46, Calif.

●**KENNEDY VAN SAUN MFG. & ENG. CORP.,** 2 Park Ave., New York 16, N. Y.

THE MINE & SMELTER SUPPLY CO., 1422 17th St., Denver 17, Colo.

MORSE BROS. MACHINERY CO., 2900 Brighton Blvd., Denver 1, Colo.

WM. E. ROBINSON & CO., 3307 Spring Garden St., Philadelphia 4, Pa.

SEPARATION PROCESS CO., Fuller Bldg., Catasauqua, Pa.

THE SINK AND FLOAT CORP., Empire State Bldg., New York 1, N. Y.

STEARNS-ROGERS MFG. CO., 1720 California St., Denver 2, Colo.

STRAUB MFG. CO., 507 Chestnut St., Oakland 7, Calif.

U. S. HOFFMAN MACHINERY CORP., 105 Fourth Ave., New York 3, N. Y.

●**WESTERN MACHINERY CO.,** 760-766 Folsom St., San Francisco 7, Calif.

FLOTATION REAGENTS & SUPPLIES

ALLEN CONE & MACHINERY CORP., 120 Broadway, New York 5, N. Y.

●**AMERICAN CYANAMID CO., MINERAL DRESSING DIV.,** 30 Rockefeller Plaza, New York 20, N. Y.

ARMOUR & COMPANY, 1355 W. 31st St., Chicago 9, Ill.

●**DIAMOND IRON WORKS, INC.,** 1728 2nd St., N., Mpls. 11, Minn.

THE DOW CHEMICAL CO., Midland, Mich.

GROCH ENGINEERING CO., 1612 W. 109 Pl., Los Angeles 46, Calif.

●**HERCULES POWDER CO.,** 946 King St., Wilmington, Del.

KOPPERS CO., INC., Koppers Bldg., Pittsburgh 19, Pa.

THE MINE & SMELTER SUPPLY CO., 1422 17th St., Denver 17, Colo.

NEWPORT INDUSTRIES, INC., 230 Park Ave., New York 17, N. Y.

NOPCO CHEMICAL CO., Dept. RP, Harrison, N. J.

ORONITE CHEMICAL CO., 38 Sansome St., San Francisco 4, Calif.

PHILADELPHIA QUARTZ CO., Public Ledger Bldg., 6th & Chestnut Sts., Philadelphia 6, Pa.

QUIGLEY COMPANY, INC., 527 Fifth Ave., New York 17, N. Y.

SEPARATION PROCESS CO., Fuller Bldg., Catasauqua, Pa.

SOUTHWESTERN ENGINEERING CO., 4800 Santa Fe Ave., Los Angeles 58, Calif.

FROGS AND SWITCHES, Railway

●**AMERICAN MANGANESE STEEL DIV. OF AMERICAN BRAKE SHOE CO.,** 401 E. 14th St., Chicago Heights, Ill.

BETHLEHEM STEEL CO., 701 E. Third St., Bethlehem, Pa.

THE C. S. CARD IRON WORKS CO., P.O. Box 117, Denver 1, Colo.

EASTON CAR & CONSTRUCTION CO., Easton, Pa.

●**THE FROG, SWITCH & MFG. CO.,** Carlisle, Pa.

MIDWEST STEEL CORP., Charleston 2, W. Va.

PRESSED STEEL CAR CO., INC., 25 Broad St., New York 4, N. Y.

●**TAYLOR-WHARTON IRON & STEEL CO.,** High Bridge, N. J.

UNITED STATES STEEL CO., Pittsburgh 30, Pa.

FURNACES, Forging

THE DENVER FIRE CLAY CO., 2301 Blake St., Denver 17, Colo.

●**DIAMOND IRON WORKS, INC.,** 1728 2nd St. N., Mpls. 11, Minn.

JOHNSTON MFG. CO., 2825 E. Hennepin Ave., Minneapolis 13, Minn.

NATIONAL AIROIL BURNER CO., 1298 E. Sedgley Ave., Phila. 34, Pa.

FUSES, Detonating & Blasting (see Blasting Supplies)

G

GAS ANALYZERS AND RECORDERS

●**BAILEY METER CO.,** 1050 Ivanhoe Road, Cleveland 10, Ohio

E. D. BULLARD CO., 275 Eighth St., San Francisco 3, Calif.

BURRELL CORP., 1942 Fifth Ave., Pittsburgh 19, Pa.

CAMBRIDGE INSTRUMENT CO. INC., 3765 Grand Central Terminal, New York 17, N. Y.

ELLISON DRAFT GAGE CO., 214 W. Kinzie St., Chicago 10, Ill.

CHARLES ENGELHARD, INC., 850 Passaic Ave., East Newark, N. J.

THE HAYS CORP., East 8th St., Michigan City, Ind.

● A dot before name indicates advertiser in this issue. See advertiser index.

DIRECTORY

LEEDS & NORTHRUP CO., 4970 Stenton Ave., Philadelphia 44, Pa.

MINNEAPOLIS - HONEYWELL REGULATOR CO., BROWN INSTRUMENTS DIV., Wayne and Roberts Aves., Philadelphia 44, Pa.

THE PERKIN-ELMER CORP., 535 Hope St., Glenbrook, Conn.

•**F. L. SMIDTH & CO.,** 11 W. 42nd St., New York 18, N. Y.

GAS BURNERS, Natural

•**THE BABCOCK & WILCOX CO., INC.,** 85 Liberty St., New York 6, N. Y.

COEN COMPANY, 40 Boardman St., San Francisco 3, Calif.

THE DENVER FIRE CLAY CO., 2301 Blake St., Denver 17, Colo.

•**DIAMOND IRON WORKS, INC.,** 1728 2nd St., No. Minneapolis 11, Minn.

•**HAUCK MFG. CO.,** 124-136 Tenth St., Brooklyn 15, N. Y.

NATIONAL AIROIL BURNER CO., 1298 E. Sedgley Ave., Philadelphia 34, Pa.

RAY OIL BURNER CO., 401 Bernal Ave., San Francisco 12, Calif.

•**F. L. SMIDTH & CO.,** 11 W. 42nd St., New York 18, N. Y.

STAPLES & PFEIFFER, 528 Bryant St., San Francisco 7, Calif.

GAS PRODUCERS

KOPPERS CO., INC., Koppers Bldg., Pittsburgh 19, Pa.

THE WELLMAN ENGINEERING CO., 7000 Central Ave., Cleveland 5, Ohio

R. D. WOOD CO., 1072 Public Ledger Bldg., Philadelphia 5, Pa.

GATES (see Bin Gates and Chutes)

GEAR-MOTORS

•**ALLIS-CHALMERS MFG. CO.,** 975 So. 70th St., Milwaukee 1, Wis.

THE CONVEYOR CO., 3260 East Slauson Ave., Los Angeles 11, Calif.

DE LAVAL STEAM TURBINE CO., Trenton 2, N. J.

THE FALK CORP., 3001 W. Canal St., Milwaukee 8, Wis.

FOOTE BROS. GEAR & MACHINE CORP., 4545 S. Western Blvd., Chicago 9, Ill.

•**GENERAL ELECTRIC CO.,** 1 River Road, Schenectady 5, N. Y.

•**LINK-BELT CO.,** 300 W. Pershing Road, Chicago 9, Ill.

PHILADELPHIA GEAR WORKS, Erie Ave. & G St., Philadelphia, Pa.

RELIANCE ELECTRIC & ENGINEERING CO., 1088 Ivanhoe Rd., Cleveland 10, Ohio

•**STERLING ELECTRIC MOTORS, INC.,** 5401 Anaheim-Telegraph Road, Los Angeles 22, Calif.

U. S. ELECTRICAL MOTORS INC., 200 E. Slauson Ave., Los Angeles 54, Calif.

WAGNER ELECTRIC CORP., 6400 Plymouth Ave., St. Louis 14, Mo.

WESTINGHOUSE ELECTRIC CO., First Nat'l Bank Bldg., Pittsburgh, Pa.

GEAR REDUCERS (see Drives)

GEARS

The C. O. BARTLETT AND SNOW CO., 6200 Harvard Ave., Cleveland 5, Ohio

BERGEN MACHINE & TOOL CO., INC., 189 Franklin St., Nutley 10, N. J.

BETHLEHEM STEEL CO., 701 E. Third St., Bethlehem, Pa.

THE CLEVELAND WORM & GEAR CO., 3249 E. Eightieth St., Cleveland 4, Ohio

THE COMMERCIAL SHEARING & STAMPING CO., P. O. Box 719, Youngsstown 1, Ohio

•**CONTINENTAL GIN CO.,** 4500 5th Ave. So., Birmingham, Ala.

THE CONVEYOR CO., 3260 East Slauson Ave., Los Angeles 11, Calif.

DE LAVAL STEAM TURBINE CO., 853 Nottingham Way, Trenton 2, N. J.

•**DIAMOND IRON WORKS, INC.,** 1728 2nd St., No. Minneapolis 11, Minn.

DODGE MFG. CORP., Mishawaka, Ind.

•**THE J. B. EHRSAM & SONS MFG. CO.,** Enterprise, Kans.

THE FALK CORP., 3001 W. Canal St., Milwaukee 8, Wis.

•**FARRELL - BIRMINGHAM CO. INC.,** Ansonia, Conn.

FOOTE BROS. GEAR & MACHINE CO., 4545 S. Western Blvd., Chicago 9, Ill.

•**THE FROG, SWITCH & MFG. CO.,** Carlisle, Pa.

•**GENERAL ELECTRIC CO.,** 1 River Road, Schenectady 5, N. Y.

GRAHAM TRANSMISSIONS INC., 3754 N. Holton St., Milwaukee 12, Wis.

GREENVILLE MFG. WORKS, 1121½ West Fourth St., Greenville, Ohio

D. O. JAMES MFG. CO., 1114 W. Monroe St., Chicago 7, Ill.

THE JEFFREY MFG. CO., 935 N. 4th St., Columbus 16, Ohio

W. A. JONES FOUNDRY & MACHINE CO., 4401 Roosevelt Rd., Chicago 24, Ill.

•**LINK-BELT CO.,** 300 W. Pershing Road, Chicago 9, Ill.

PHILADELPHIA GEAR WORKS, Erie Ave. & G St., Philadelphia, Pa.

PYOTT FOUNDRY & MACHINE CO., 328 No. Sangamon St., Chicago 7, Ill.

SPROUT, WALDRON & CO., INC., Muncy 2, Pa.

STEARNS-ROGERS MFG. CO., 1720 California St., Denver 2, Colo.

STEPHENS-ADAMSON MFG. CO., 7 Ridgeway Ave., Aurora, Ill.

STROH PROCESS STEEL CO., 1428 High St., Pittsburgh 12, Pa.

WIS. FOUNDRY & MACHINE CO., 623 E. Main St., Madison, Wis.

GENERATOR SETS, Electric

1. **Diesel Engine**
2. **Gasoline Engine**
3. **Electric Motor**
4. **Turbine**

•**ALLIS-CHALMERS MFG. CO.,** 975 So. 70th St., Milwaukee 1, Wis.
2—3—4

B. F. M. INDUSTRIES, INC., 2124 Mill Ave., Brooklyn 34, N. Y.
1—2—3

THE BUDA COMPANY, 154th & Commercial, Harvey, Ill.
1—2

BUFFALO GASOLINE ENGINE SERVICE, 175 Great Arrow Ave., Buffalo 7, N. Y.
2

•**CATERPILLAR TRACTOR CO.,** Peoria 8, Ill.
1

CENTURY ELECTRIC CO., 1806 Pine St., St. Louis 3, Mo.
3

•**CHICAGO PNEUMATIC TOOL CO.,** 6 E. 44th St., New York 17, N. Y.
1

CONSOLIDATED DIESEL ELEC. CORP., Ludlow and Canal Sts., Stamford, Conn.
1—2

THE COOPER-BESSEMER CORP., Mount Vernon, Ohio
1

CROCKER-WHEELER ELECTRIC MFG. CO., DIV. OF ELLIOTT CO., Ampere, N. J.
3

CUMMINS ENGINE CO., INC., Fifth & Union Sts., Columbus, Ind.
1

DAVEY COMPRESSOR CO., N. Water & Saginor Sts., Kent, Ohio
1—2—3

DE LAVAL STEAM TURBINE CO., Trenton 2, N. J.
4

•**DETROIT DIESEL ENGINE DIV., GENERAL MOTORS CORP.,** 13400 W. Outer Dr., Detroit 28, Mich.
1

ELECTRIC MACHINERY MFG. CO., 1331 Tyler St., N. E., Minneapolis 14, Minn.
3

FAIRBANKS MORSE & CO., 600 S. Michigan Ave., Chicago 5, Ill.
1—2—3

•**GENERAL ELECTRIC CO.,** 1 River Road, Schenectady 5, N. Y.
3—4

GREENVILLE MFG. WORKS, 1121½ West Fourth St., Greenville, Ohio
1—3

HILL DIESEL ENGINE CORP., 238 Mill St., Lansing 3, Mich.
1

HOBART BROTHERS CO., Hobart Square, Troy, Ohio
1—2—3

HOMELITE CORP., Riverdale Ave., Port Chester, N. Y.
2

INTERNATIONAL DIESEL ELECTRIC CO., INC., 13-02 44th Ave., Long Island City 1, N. Y.
1—2

•**LEROI CO.,** 1706 So. 68th St., Milwaukee, Wis.
2

LISTER BLACKSTONE INC., 420 Lexington Ave., New York 17, N. Y.
1

LITTLEFORD BROS., INC., 453 E. Pearl St., Cincinnati 2, Ohio
3—4

THE LOUIS ALLIS CO., 427 E. Stewart St., Milwaukee 7, Wis.
3

MURPHY DIESEL CO., 5317 W. Burnham St., Milwaukee 14, Wis.
1

•**NORDBERG MFG. CO.,** 3073 S. Chase Ave., Milwaukee 7, Wis.
1

D. W. ONAN & SONS INC., University Ave., S.E. at 25th, Minneapolis 14, Minn.
1—2

RELIANCE ELECTRIC & ENGINEERING CO., 1088 Ivanhoe Rd., Cleveland 10, Ohio
3

SHEPPARD DIESELS, Philadelphia St., Hanover, Pa.
1

STERLING MACHINERY CORP., 411 Southwest Blvd., Kansas City 8, Mo.
2

WESTINGHOUSE ELECTRIC CO., First Nat'l Bank Bldg., Pittsburgh, Pa.
1—2—3—4

LAWRENCE WILSON, 215 Main St., Buffalo, N. Y.
2

WITTE ENGINE WORKS, DIV. OF OIL WELL SUPPLY CO., 1600 Oakland Ave., Kansas City 3, Mo.
1

WORTHINGTON PUMP & MACHINERY CORP., Worthington Ave., Harrison, N. J.
1—4

GRAPPLES (see Buckets)

GREASE (see Lubricants)

GRINDERS, for Detachable Bits (see Bits, Grinders)

GRINDERS, Concrete Facing

GARDNER MACHINE CO., Beloit, Wis.

GRINDING AIDS, Cement

AUTOLENE LUBRICANTS CO., PROTEX DIVN., 1331 W. Evans Ave., Denver 9, Colo.

DEWEY AND ALMY CHEMICAL CO., 62 Whittemore Ave., Cambridge 40, Mass.

HARDINGE CO., INC., 240 Arch St., York, Pa.

GRINDING MEDIA, Mills

ABBE ENGINEERING CO., 50 Church St., New York 7, N. Y.

•**ALLIS - CHALMERS MFG. CO.,** 975 So. 70th St., Milwaukee 1, Wis.

•**THE BABCOCK & WILCOX CO., INC.,** 85 Liberty St., New York 6, N. Y.

THE CALIFORNIA WIRE CLOTH CORP., 1080 19th Ave., Oakland 6, Calif.

COATES STEEL PRODUCTS CO., Greenville, Ill.

•**THE COLORADO FUEL & IRON CORP.,** Continental Oil Bldg., Denver 2, Colo.

GREENVILLE MFG. WORKS, 1121½ West Fourth St., Greenville, Ohio

•**HARDINGE CO., INC.,** 240 Arch St., York, Pa.

•**KENNEDY VAN SAUN MFG. & ENG. CORP.,** 2 Park Ave., New York 16, N. Y.

MANGANESE STEEL FORGE CO., Richmond St. & Castor Ave., Philadelphia 34, Pa.

THE MINE & SMELTER SUPPLY CO., 1422 17th St., Denver 17, Colo.

THE PATTERSON FOUNDRY & MACHINE CO., 1250 St. George St., East Liverpool, Ohio

THE PENNEBACKER CO., 3rd & Furnace Sts., Emmaus, Pa.

PULVERIZING MACHINERY CO., Chatham Road, Summit, N. J.

•**RAYMOND PULVERIZER DIV., COMBUSTION ENG. CO. INC.,** 1315 N. Branch St., Chicago 22, Ill.

•**SHEFFIELD STEEL CORP.,** Sheffield Sta., Kansas City 3, Mo.

•**F. L. SMIDTH & CO.,** 11 W. 42nd St., New York 18, N. Y.

STRAUB MFG. CO., 507 Chestnut St., Oakland 7, Calif.

TRAYLOR ENGINEERING & MFG. CO., Allentown, Pa.

UNITED STATES STEEL CO., 525 William Penn Place, Pittsburgh 30, Pa.

•**WILLIAMS PATENT CRUSHER & PULV. CO.,** 800 St. Louis Ave., St. Louis 6, Mo.

• A dot before name indicates advertiser in this issue. See advertiser index.

DIRECTORY

GRINDING MILL CONTROLS, Feed Regulators

•**ALLIS-CHALMERS MFG. CO.,** 975 So. 70th St., Milwaukee 1, Wis.

•**HARDINGE CO., INC.,** 240 Arch St., York, Pa.

THE MINE & SMELTER SUPPLY CO., 1422 17th St., Denver 17, Colo.

•**F. L. SMIDTH & CO.,** 11 W. 42nd St., New York 18, N. Y.

GRINDING PEBBLES (see Grinding Media)

GRIZZLIES (see Screens)

GUARDS, Machinery

HARRINGTON & KING PERFORATING CO., 5655 Fillmore St., Chicago 44, Ill.

THE KIRK & BLUM MFG. CO., 3120 Forrer, Cincinnati 9, Ohio

THE STANDARD METAL MFG. CO., Malinta, Ohio

THE W. S. TYLER CO., 3615 Superior Ave., Cleveland 14, Ohio

WISCONSIN FOUNDRY AND MACHINE CO., 623 E. Main St., Madison, Wis.

GUNS & CARTRIDGES, Kiln Ring Removal

REMINGTON ARMS CO., INC., 939 Barnum Ave., Bridgeport 2, Conn.

WINCHESTER REPEATING ARMS CO., 275 Winchester Ave., New Haven, Conn.

GUNS, Hydraulic Monitor (see Monitors, Hydraulic)

GYPSUM PLANT MACHINERY

BODINSON MFG. CO., 2401 Bayshore Blvd., San Francisco 24, Calif.

•**THE J. B. EHRSAM & SONS MFG. CO.,** Enterprise, Kans.

THE HER-BORN ENGR. & MFG. CO., P. O. Box 666, Sandusky, Ohio

•**KENNEDY VAN SAUN MFG. & ENG. CORP.,** 2 Park Ave., New York 16, N. Y.

•**McLANAHAN AND STONE CORP.,** Hollidaysburg, Pa.

NOVERA INC., 420 Lexington Ave., New York 17, N. Y.

PENNSYLVANIA CRUSHER CO., Liberty Trust Bldg., Philadelphia 7, Pa.

•**RAYMOND PULVERIZER DIV., COMBUSTION ENG. CO. INC.,** 1315 N. Branch St., Chicago 22, Ill.

•**F. L. SMIDTH & CO.,** 11 W. 42nd St., New York 18, N. Y.

•**SMITH ENGINEERING WORKS,** 532 E. Capitol Dr., Milwaukee 12, Wis.

STEPHENS-ADAMSON MFG. CO., 7 Ridgeway Ave., Aurora, Ill.

STURTEVANT MILL CO., 102 Clayton St., Boston 22, Mass.

GYPSUM PLANTS, Engineers, Contractors

E. LEE HEIDENREICH, JR., 67 Second St., Newburgh, N. Y.

•**KENNEDY VAN SAUN MFG. & ENG. CORP.,** 2 Park Ave., New York 16, N. Y.

NOVERA INC., 420 Lexington Ave., New York 17, N. Y.

WM. E. ROBINSON & CO., 3633 Spring Garden St., Philadelphia 4, Pa.

SOUTHWESTERN ENGINEERING CO., 4800 Santa Fe Avenue, Los Angeles 58, Calif.

STEARNS-ROGERS MFG. CO., 1720 California St., Denver 2, Colo.

H

HAMMERMILLS (see Crushers, Hammer)

HARDENERS, Concrete

AMERICAN FLURESIT CO., INC., 4011 Red Bank Road, Cincinnati 27, Ohio

A. C. HORN CO., INC., 10th St. and 44th Ave., Long Island City 1, N. Y.

•**THE MASTER BUILDERS CO.,** 7016 Euclid Ave., Cleveland 3, Ohio

PHILADELPHIA QUARTZ CO., Public Ledger Bldg., 6th and Chestnut Sts., Philadelphia 6, Pa.

SIKA CHEMICAL CORP., 35 Gregory Ave., Passaic, N. J.

SPRAY-O-BOND COMPANY, 2225 N. Humboldt Ave., Milwaukee 12, Wis.

TAMMS INDUSTRIES, INC., 228 No. LaSalle St., Chicago 1, Ill.

HARD SURFACING METALS (see Welding Rods, Hard Facing)

HEAT EXCHANGERS

B. F. M. INDUSTRIES, INC., 2124 Mill Ave., Brooklyn 34, N. Y.

•**THE BABCOCK & WILCOX CO.,** 85 Liberty St., New York 6, N. Y.

COEN COMPANY, 40 Boardman St., San Francisco 3, Cal.

INGERSOLL-RAND CO., 11 Broadway, New York 4, N. Y.

MANITOWOC ENGINEERING WORKS, Manitowoc, Wis.

THE PATTERSON FOUNDRY & MACHINE CO., 1250 St. George St., East Liverpool, Ohio

•**F. L. SMIDTH & CO.,** 11 W. 42nd St., New York 18, N. Y.

SOUTHWESTERN ENGINEERING CO., 4800 Sante Fe Avenue, Los Angeles 58, Calif.

STAPLES & PFEIFFER, 528 Bryant St., San Francisco 7, Calif.

STRUTHERS WELLS CORP., Pennsylvania Ave., Warren, Pa.

WORTHINGTON PUMP & MACHINERY CORP., Worthington Ave., Harrison, N. J.

YOUNG RADIATOR CO., 709 S. Marquette St., Racine Wis.

HEAT TREATING MACHINES, Drill Steel

•**GARDNER-DENVER CO.,** Quincy, Ill.

MAHR MFG. CO., DIV. DIAMOND IRON WKS., 1728 2nd St., No., Minneapolis 11, Minn.

HEATERS, Concrete Mixer

AEROIL PRODUCTS CO., 5701 Park Ave., West New York, N. J.

•**HAUCK MFG CO.,** 124-136 Tenth St., Brooklyn 15, N. Y.

LITTLEFORD BROS. INC., 460 East Pearl St., Cincinnati, Ohio

HEATERS, ELECTRIC, Bitumen

•**GENERAL ELECTRIC CO.,** 1 River Road, Schenectady 5, N. Y.

HEATERS, Plant, Hot Air

AMERICAN BLOWER CORP., Box 58, Roosevelt Annex, Detroit 32, Mich.

BUFFALO FORGE CO., 490 Broadway, Buffalo 5, N. Y.

CLARAGE FAN CO., 619 Porter St., Kalamazoo 16, Mich.

COMBUSTION EQUIPMENT DIV., TODD SHIPYARDS CORP., 81-16 45th Ave., Elmhurst, Queens, N. Y.

DRAVO CORPORATION, Neville Island, Pittsburgh 25, Pa.

•**GENERAL ELECTRIC CO.,** 1 River Road, Schenectady 5, N. Y.

HEAVY-MEDIA SEPARATION PROCESS

•**AMERICAN CYANAMID CO., MINERAL DRESSING DIV.,** 30 Rockefeller Plaza, New York 20, N. Y.

THE SINK & FLOAT CORP., 100 Park Ave., New York 17, N. Y.

WESTERN MACHINERY CO., 760 Folsom St., San Francisco 7, Cal.

HOISTS

•**AMERICAN HOIST & DERRICK CO.,** 63 S. Robert St., St. Paul 1, Minn.

AMERICAN STEEL DREDGE CO., INC., 2511 Taylor St., Fort Wayne 6, Ind.

ANTHONY COMPANY, Streator, Ill.

ATLAS CORP., Mountville, Pa.

BEEBE BROS., 2724 Sixth Ave., Seattle 4, Wash.

THE BRADY CONVEYOR CORP., 20 W. Jackson Blvd., Chicago 4, Ill.

C. H. & E. MFG. CO., 3849 N. Palmer St., Milwaukee 12, Wis.

•**CHICAGO PNEUMATIC TOOL CO.,** 6 E. 44th St., New York 17, N. Y.

CHISHOLM-MOORE HOIST CORP., Fremont Ave., Kenmore, N. Y.

THE CLEVELAND CHAIN & MFG. CO., 445 Henry St., Cleveland 5, Ohio

THE CLEVELAND CRANE & ENGINEERING CO., 5866 E. 289th St., Wickliffe, Ohio

•**CLIPPER MFG. CO.,** 2807 Warwick, Kansas City 8, Mo.

CLYDE IRON WORKS, INC., P. O. Box 370, Duluth 1, Minn.

COFFING HOIST CO., 800 Walter St., Danville, Ill.

CONSTRUCTION MACHINERY CO'S., Glenwood & Vinton Sts., Waterloo, Iowa

CURTIS PNEUMATIC MACHINERY CO., 1988 Kienlien Ave., St. Louis 20, Mo.

DAYBROOK HYDRAULIC CORP., 500 Lehman Ave., Bowling Green, Ohio

DEMPSTER BROTHERS, INC., Springdale St., Knoxville 17, Tenn.

•**DENVER EQUIPMENT CO.,** 1410 Seventeenth St., Denver 17, Colo.

DODSON MFG. CO., INC., 1463 Barwise, Wichita 2, Kans.

ELECTRO LIFT, INC., 30 Church St., New York 7, N. Y.

FORD CHAIN BLOCK DIV., AMERICAN CHAIN & CABLE CO., INC., Reading, Pa.

GALENA MACHINE & ELECTRIC CO., 209-11 Main St., Galena, Kans.

GAR WOOD INDUSTRIES, INC., Wayne Div., Wayne, Mich.

•**GARDNER-DENVER CO.,** Quincy, Ill.

F. C. GEORGE MACHINE CO., INC., 100 S. Westmoreland Dr., Orlando, Fla.

GREENVILLE MFG. WORKS, 1121½ W. 4th, Greenville, Ohio

•**HARNISCHFEGER CORP.,** 4400 W. National Ave., Milwaukee 14, Wis.

THE HEIL CO., 3000 W. Montana St., Milwaukee 1, Wis.

•**ROBINS CONVEYORS DIV., HEWITT-ROBINS INC.,** 270 Passaic Ave., Passaic, N. J.

HYDRO-FORGED STONE ASSOCIATES, INC., 420 Bulkley Bldg., Cleveland 15, Ohio

INDEPENDENT PNEUMATIC TOOL CO., 175 State St., Aurora, Ill.

•**THE JAEGER MACHINE CO.,** 550 W. Spring St., Columbus 16, Ohio

THE JEFFREY MFG. CO., 935 N. 4th St., Columbus 16, Ohio

•**JOY MANUFACTURING CO.,** Henry W. Oliver Bldg., Pittsburgh 22, Pa.

•**THE KENT MACHINE CO.,** 113 E. Portage Trail, Cuyahoga Falls, Ohio

LEWIS-SHEPARD PRODUCTS INC., 206 Walnut St., Watertown 72, Mass.

•**McLANAHAN AND STONE CORP.,** Hollidaysburg, Pa.

•**NORDBERG MFG. CO.,** 3073 So. Chase Ave., Milwaukee 7, Wis.

NOVO ENGINE CO., 702 Porter St., Lansing 5, Mich.

O. K. CLUTCH & MACHINERY CO., Florence St., Columbia, Pa.

ROGERS IRON WORKS CO., 11th & Pearl Sts., Joplin, Mo.

ST. PAUL HYDRAULIC HOIST CO., 2207 University Ave. S. E., Minneapolis 14, Minn.

•**SAUERMAN BROS., INC.,** 530 S. Clinton St., Chicago 7, Ill.

SHEPARD NILES CRANE & HOIST CORP., Schuyler Ave., Montour Falls, N. Y.

SILENT HOIST & CRANE CO., 879 63rd St., Brooklyn 20, N. Y.

STEARNS-ROGERS MFG. CO., 1720 California St., Denver 2, Colo.

STEPHENS-ADAMSON MFG. CO., 7 Ridgeway Ave., Aurora, Ill.

STERLING MACHINERY CORP., 411 Southwest Blvd., Kansas City 8, Mo.

SUPERIOR-LIDGERWOOD-MUNDY CORP., 7 Dey St., New York 7, N. Y.

TRUCK EQUIPMENT CO. INC., 1791 Fillmore Ave., Buffalo 14, N. Y.

WIS. FOUNDRY AND MACHINE CO., 623 E. Main St., Madison, Wis.

WOOLDRIDGE MANUFACTURING CO., Sunnyvale, Calif.

WRIGHT HOIST DIV., AMERICAN CHAIN & CABLE CO., INC., York, Pa.

THE YALE & TOWNE MFG. CO., Philadelphia 15, Pa.

HOPPERS, Aggregates, Cement, etc.

ALPHA TANK & SHEET METAL MFG. CO., 5001 S. 38th Street, St. Louis 16, Mo.

ANDERSON ENGINEERING CO., 237 Bent St., Cambridge 41, Mass.

THE C. O. BARTLETT AND SNOW CO., 6200 Harvard Ave., Cleveland 5, Ohio

BETHLEHEM STEEL CO., 7 E. 3rd St., Bethlehem, Penna.

•**BLAW-KNOX CO.,** Farmers Bank Bldg., Pittsburgh 22, Pa.

BODINSON MFG. CO., 2401 Bayshore Blvd., San Francisco 24, Calif.

•**BUTLER BIN CO.,** Box 407, Waukesha, Wis.

• A dot before name indicates advertiser in this issue. See advertiser index.

DIRECTORY

CHASE CONCRETE MACHINERY CO., 15 Linwood Ave., Buffalo 2, N. Y.

CHICAGO STEEL FOUNDRY COMPANY, 3720 So. Kedzie Ave., Chicago 32, Ill.

CONCRETE TRANSPORT MIXER CO., 4985 Fyler Ave., St. Louis 9, Mo.

CONSTRUCTION MACHINERY COS., Glenwood & Vinton Sts., Waterloo, Iowa

●**CONTINENTAL GIN CO.,** P. O. Box 2614, Birmingham, Ala.

THE CONVEYOR CO., 3260 East Slauson Ave., Los Angeles 11, Calif.

●**DIAMOND IRON WORKS INC.,** 1728 2nd St. No., Minneapolis 11, Minn.

●**FLEMING MFG. CO.,** 4985 Fyler Ave., St. Louis, Mo.

GAR-BRO. MFG. CO., 2416 E. 16th St., Los Angeles 21, Calif.

GENERAL ENGINES CO., INC., 307 Hunter St., Gloucester, N. J.

GREENVILLE MFG. WORKS, 1121½ West Fourth St., Greenville, Ohio

HARDY SCALES CO., 5701 So. Atlantic Blvd., Maywood, Calif.

THE HELTZEL STEEL FORM AND IRON CO., 1750 Thomas Road, Warren, Ohio

●**ROBINS CONVEYORS DIV., HEWITT-ROBINS INC.,** 270 Passaic Ave., Passaic, N. J.

●**IOWA MFG. CO.,** 916 16th St. N. E., Cedar Rapids, Iowa

THE JEFFREY MFG. CO., 935 N. 4th St., Columbus 16, Ohio

●**THE C. S. JOHNSON CO.,** P. O. Box 71, Champaign, Ill.

LANDIS STEEL CO., 116 W. A St., Picher, Okla.

E. F. MARSH ENG. CO., 4324 W. Clayton Ave., St. Louis 10, Mo.

MIXERMOBILE MANUFACTURERS, 6855 N. E. Halsey St., P.O. Box 5108, Portland 16, Oregon

NOBLE CO., 1860 Seventh St., Oakland 20, Calif.

SPEEDBLOCK, INC., 1144 Union Commerce Bldg., Cleveland 14, Ohio

●**SuPREMIX, INC.,** 401 Grace St., Adrian, Mich.

R. K. TYRA CORP., Tyra, Minn.

WITTEMANN MACHINERY CO., Paynters Rd., Farmingdale, N. J.

HOPPERS, Unloading Ready Mixed Concrete

●**BUTLER BIN CO.,** Box 407, Waukesha, Wis.

CONCRETE TRANSPORT MIXER CO., 4985 Fyler Ave., St. Louis 9, Mo.

●**FLEMING MFG. CO.,** 4985 Fyler Ave., St. Louis 9, Mo.

GAR-BRO MFG CO., 2416 E. 16th St., Los Angeles 21, Calif.

●**THE JAEGER MACHINE CO.,** 550 W. Spring St., Columbus 16, Ohio

STEPHENS-ADAMSON MFG CO., 7 Ridgeway Ave., Aurora, Ill.

WITTEMANN MACHINERY CO., Paynters Road, Farmingdale, N. J.

HOSE, Rubber

1. **Hydraulic**
2. **Pneumatic**
3. **Oil**
4. **Sand**

AEROQUIP CORP., 300 S. East Ave., Jackson, Mich.
1—2—3—4

AMERICAN VENTILATING HOSE CO., 100 Park Ave., New York 17, N. Y.
2

●**BOSTON WOVEN HOSE & RUBBER CO.,** P. O. Box 1071, Boston 3, Mass.
1—2—3—4

THE BRADY CONVEYORS CORP., 20 W. Jackson Blvd., Chicago 4, Ill.
2

CARLYLE RUBBER CO., INC., 62-66 Park Pl., New York 7, N. Y.
1—2—3—4

●**CHICAGO PNEUMATIC TOOL CO.,** 6 E. 44th St., New York 17, N. Y.
2

THE CINCINNATI RUBBER MFG. CO., Franklin Ave., Cincinnati 12, Ohio
1—2—3—4

CONTINENTAL RUBBER CO., 1999 Liberty Blvd., Erie, Pa.
1—2—3—4

DAYTON RUBBER MFG. CO., 4th St. and Jefferson, Dayton, Ohio
1

THE DeVILBISS CO., 300 Phillips Ave., Toledo 1, Ohio
2—3

ERIE PUMP & ENGINE WORKS, 163 Glenwood Ave., Medina, N. Y.
4

●**GARDNER-DENVER CO.,** Quincy, Ill.
1—2

THE GATES RUBBER CO., 999 S. Broadway, Denver 17, Colo.
1—2—3—4

L. H. GILMER CO., DIV. OF UNITED STATES RUBBER CO., Tacony 35, Pa.
1—2—3—4

GOODALL RUBBER CO., Whitehead Road, Trenton 4, N. J.
1—2—3—4

●**B. F. GOODRICH CO.,** Akron 11, Ohio
1—2—3

●**THE GOODYEAR TIRE & RUBBER CO., INC.,** 1144 E. Market St., Akron 16, Ohio
2—3—4

GREENVILLE MFG. WORKS, 1121½ W. Fourth St., Greenville, Ohio

HAMILTON RUBBER MFG. CORP., Mead St., Trenton 3, N. J.
1—2—3—4

●**HEWITT RUBBER DIV., HEWITT-ROBINS INC.,** 240 Kensington Ave., Buffalo 5, N. Y.
1—2—3—4

LINCOLN ENGINEERING CO., 5701 Natural Bridge, St. Louis 20, Mo.
3

QUAKER RUBBER CORP., Tacony & Comly Sts., Philadelphia 24, Pa.
1—2—3—4

RAYBESTOS - MANHATTAN, INC., 61 Willett St., Passaic, N. J.
1—2—3

●**REPUBLIC RUBBER DIV., LEE RUBBER & TIRE CORP.,** Albert St., Youngstown 1, Ohio
2—3—4

RODGERS HYDRAULIC INC., 7401 Walker St., Minneapolis 16, Minn.
1

STAPLES & PFEIFFER, 528 Bryant St., San Francisco 7, Calif.
3

●**THERMOID COMPANY,** Trenton, N. J.
1—2—3—4

UNITED STATES RUBBER CO., 1230 Ave. of the Americas, New York 20, N. Y.
1—2—3—4

WORTHINGTON PUMP & MACHINERY CORP., Worthington Ave., Harrison, N. J.
2

HOSE FITTINGS

AEROQUIP CORP., 300 S. East Ave., Jackson, Mich.

●**BOSTON WOVEN HOSE & RUBBER CO.,** P. O. Box 1071, Boston 3, Mass.

CARLYLE RUBBER CO., INC., 62-66 Park Pl., New York 7, N. Y.

●**CHICAGO PNEUMATIC TOOL CO.,** 6 E. 44th St., New York 17, N. Y.

THE CINCINNATI RUBBER MFG. CO., Franklin Ave., Cincinnati 12, Ohio

THE DeVILBISS CO., 300 Phillips Ave., Toledo 1, Ohio

DIXON VALVE & COUPLING CO., Hancock & Columbia Ave., Philadelphia 2, Pa.

●**GARDNER-DENVER CO.,** Quincy, Ill.

THE GATES RUBBER CO., 999 S. Broadway, Denver 17, Colo.

GOODALL RUBBER CO., Whitehead Road, Trenton 4, N. J.

GREENVILLE MFG. WORKS, 1121½ W. Fourth St., Greenville, Ohio

HAMILTON RUBBER MFG. CORP., Mead St., Trenton 3, N. J.

HARDSOGG PNEUMATIC TOOL CO., 225 So. Benton St., Ottumwa, Iowa

●**HEWITT RUBBER DIV., HEWITT-ROBINS INC.,** 240 Kensington Ave., Buffalo 5, N. Y.

INDEPENDENT PNEUMATIC TOOL CO., 175 N. State St., Aurora, Ill.

KNOX MFG. CO., 226 W. Clinton Ave., Oaklyn, N. J.

LINCOLN ENGINEERING CO., 5701 Natural Bridge, St. Louis 20, Mo.

●**NEW HAVEN VIBRATOR CO.,** 145 Chestnut St., New Haven 7, Conn.

C. A. NORGREN CO., 3400 S. State St., Englewood, Ohio

RAYBESTOS - MANHATTAN, INC., 61 Willett St., Passaic, N. J.

●**THERMO'D COMPANY,** Trenton, N. J.

UNITED STATES RUBBER CO., 1230 Ave. of the Americas, New York 20, N. Y.

WORTHINGTON PUMP & MACHINERY CORP., Worthington Ave., Harrison, N. J.

HULLS, Dredge (see Dredges)

HUMIDIFIERS, Laboratory (see Laboratory Apparatus)

HYDRAULIC CYLINDERS

BLACKHAWK MFG. CO., 5325 W. Rogers St., Milwaukee, Wis.

THE COMMERCIAL SHEARING & STAMPING CO., P.O. Box 719, Youngstown 1, Ohio

DAYBROOK HYDRAULIC CORP., 500 Lehman Avenue, Bowling Green, Ohio

HENNEUSE ENGINEERING CO., Marion, Ohio

LANDIS STEEL CO., 116 W. A St., P.O. Box 248, Picher, Okla.

LAPLANT-CHOATE MFG. CO., INC., 2920 1st Ave. N.E., Cedar Rapids, Iowa

LEDEEN MFG. CO., 1600 S. San Pedro St., Los Angeles 15, Calif.

RODGERS HYDRAULIC, INC., 7401 Walker St., Minneapolis 16, Minn.

THE RUCKER CO., 4228 Hollis St., Oakland 8, Calif.

SHEPPARD DIESELS, Philadelphia St., Hanover, Pa.

VICKERS INC., DIV. SPERRY CORP., 1400 Oakman Blvd., Detroit 32, Mich.

R. D. WOOD CO., 1072 Public Ledger Bldg., Philadelphia 5, Pa.

HYDRATORS, Lime

ARNOLD & WEIGEL DIV., TOLEDO ENGINEERING CO., INC., 958 Wall St., Toledo 6, Ohio

●**THE DORR CO., ENGINEERS,** Barry Place, Stamford, Conn.

●**HARDINGE CO., INC.,** 240 Arch St., York, Pa.

●**KENNEDY VAN SAUN MFG. & ENG. CORP.,** 2 Park Ave., New York 16, N. Y.

THE KRITZER COMPANY, INC., 2901 Lawrence Ave., Chicago 25, Ill.

●**NORDBERG MFG. CO.,** 3073 S. Chase Ave., Milwaukee 7, Wis.

●**TRAYLOR ENGINEERING & MFG. CO.,** Allentown, Pa.

HYDROSEPARATORS (see Sand Recovery Machinery)

I

IDLERS, Conveyor (see Conveyor Idlers)

INDICATORS, Bin (see Bin Level Indicators)

INSULATION, Heat (see Refractories)

INSTRUMENTS, Process Control

THE FOXBORO CO., Neponset Ave., Foxboro, Mass.

●**GENERAL ELECTRIC CO.,** 1 River Road, Schenectady 5, N. Y.

THE HAYS CORP., East 8th St., Michigan City, Ind.

LEEDS AND NORTHRUP CO., 4970 Stenton Ave., Philadelphia 44, Pa.

MINNEAPOLIS - HONEYWELL REGULATOR CO., BROWN INSTRUMENT DIV., Wayne and Roberts Aves., Philadelphia 44, Pa.

NORTH AMERICA PHILIPS CO., INC., 100 E. 42nd St., New York 17, N. Y.

PYROMETER INSTRUMENT CO., INC., 92 Portland Ave., Bergenfield, N. J.

WHEELCO INSTRUMENTS CO., 847 W. Harrison St., Chicago 7, Ill.

J

JACKS

ANTHONY COMPANY, Streator, Ill.

BLACKHAWK MFG. CO., 5325 W. Rogers St., Milwaukee, Wis.

●**COMMERCIAL SHEARING & STAMPING CO.,** P.O. Box 719, Youngstown 1, Ohio

ERIE PUMP & ENGINE WORKS, 163 Glenwood Ave., Medina, N. Y.

LAPLANT-CHOATE MFG. CO. INC., 2920 1st Ave. N. E., Cedar Rapids, Iowa

H. K. PORTER, INC., 74 Foley, Somerville 43, Mass.

RODGERS HYDRAULIC INC., 7401 Walker St., Minneapolis 16, Minn.

WAUKESHA MOTOR CO., West St. Paul Ave., Waukesha, Wis.

● A dot before name indicates advertiser in this issue. See advertiser index.

DIRECTORY

JIGS, Sand and Gravel

THE CONVEYOR CO., 3260 East Slauson Ave., Los Angeles 11, Calif.
•**DENVER EQUIPMENT CO.,** 1410 Seventeenth St., Denver 17, Colo.
•**McLANAHAN AND STONE CORP.,** Hollidaysburg, Pa.
OVERSTROM & SONS, 2213 W. Mission Road, Alhambra, Calif.
ROGERS IRON WORKS CO., Joplin, Mo.
THE SINK AND FLOAT CORP., Empire State Bldg., New York 1, N. Y.
•**YUBA MFG. CO.,** 351 California St., San Francisco 4, Calif.

K

KETTLES, Gypsum, Calcining

•**THE J. B. EHRSAM & SONS MFG. CO.,** Enterprise, Kans.
NOVERA INC., 420 Lexington Ave., New York 17, N. Y.
THE PATTERSON FOUNDRY & MACHINE CO., 1250 St. George St., East Liverpool, Ohio

KILN PARTS, ENDS, ETC.

•**ALLIS-CHALMERS MFG. CO.,** 975 So. 70th St., Milwaukee 1, Wis.
•**THE BABCOCK & WILCOX CO.,** 85 Liberty St., New York 6, N. Y.
CHICAGO STEEL FOUNDRY COMPANY, 3720 So. Kedzie Ave., Chicago 32, Ill.
ELECTRO-ALLOYS DIV., AMERICAN BRAKE SHOE CO., Taylor St. & Abbey Road, Elyria, Ohio
•**KENNEDY VAN SAUN MFG. & ENG. CORP.,** 2 Park Ave., New York 16, N. Y.
•**F. L. SMIDTH & CO.,** 11 W. 42nd St., New York 18, N. Y.
SOUTHWESTERN ENGINEERING CO., 4800 Sante Fe Ave., Los Angeles 58, Calif.
STROH PROCESS STEEL CO., 1428 High St., Pittsburgh 12, Pa.
•**TRAYLOR ENGINEERING & MFG. CO.,** Allentown, Pa.
UNITED IRON WORKS CO., 108 No. Locust, Pittsburg, Kans.
•**VULCAN IRON WORKS,** 700 So. Main St., Wilkes-Barre, Pa.

KILNS, Curing, Concrete

ANCHOR CONCRETE MACHINERY CO., 1191 Fairview Ave., Columbus 12, Ohio
CAMPION FUEL ENG. DIV., P. O. Box 3941P, Detroit 27, Mich.
THE CARTER-WATERS CORP., 2440 Pennway, Kansas City 8, Mo.
HARDINGE CO., INC., 240 Arch St., York, Pa.
A. C. HORN CO., INC., 10th St. & 44th Ave., Long Island City 1, N. Y.
JACKSON & CHURCH CO., 321 N. Hamilton St., Saginaw, Mich.
LESSMAN MANUFACTURING CO., E. 20th & Easton Blvd., Des Moines 4, Iowa
LITTLEFORD BROS., INC., 453 E. Pearl St., Cincinnati 2, Ohio
VICTOR J. NELSON ENG. CO., 1560 Victory Blvd., Glendale 1, Calif.
•**SHORE ENGINEERING,** 320 Broadway, New York 7, N. Y.
•**VULCAN IRON WORKS,** 700 So. Main St., Wilkes-Barre, Pa.

KILNS, Lime, Vertical

ARNOLD & WEIGEL DIV., TOLEDO ENGINEERING CO., INC., 958 Wall St., Toledo 6, Ohio
•**THE ELLERNAN CO.,** 203 Continental Bank Bldg., Salt Lake City 1, Utah
•**HARDINGE CO., INC.,** 240 Arch St., York, Pa.
VICTOR J. NELSON ENG. CO., 1560 Victory Blvd., Glendale 1, Calif.
NICHOLS ENGINEERING & RESEARCH CORP., 70 Pine St., New York 5, N. Y.
STRUTHERS WELLS CORP., Pennsylvania Ave., Warren, Pa.
TRAYLOR ENGINEERING & MFG. CO., Allentown, Pa.
•**VULCAN IRON WORKS,** 700 So. Main St., Wilkes-Barre, Pa.

KILNS, Rotary, Cement, Gypsum, Lime

•**ALLIS-CHALMERS MFG. CO.,** 975 So. 70th St., Milwaukee 1, Wis.
BETHLEHEM STEEL CO., 701 E. Third St., Bethlehem, Pa.
BIRMINGHAM TANK CO., DIV. OF INGALLS IRON WORKS CO., P.O. Drawer 1490, Birmingham, Ala.
THE BONNOT CO., 722 Mulberry S.E., Canton 2, Ohio
•**HARDINGE CO., INC.,** 240 Arch St., York, Pa.
W. P. HEINEKEN CO., 227 Fulton St., New York 7, N. Y.
•**KENNEDY VAN SAUN MFG. & ENG. CORP.,** 2 Park Ave., New York 16, N. Y.
McDERMOTT BROS. CO., Ft. of Washington St., Allentown, Pa.
•**NORDBERG MFG. CO.,** 3073 So. Chase Ave., Milwaukee 7, Wis.
NOVERA INC., 420 Lexington Ave., New York 17, N. Y.
POSEY IRON WORKS, INC., INDUSTRIAL HEATING DIVN., 560 S. Prince St., Lancaster, Pa.
•**F. L. SMIDTH & CO.,** 11 W. 42nd St., New York 18, N. Y.
STRUTHERS WELLS CORP., Pennsylvania Ave., Warren, Pa.
•**TRAYLOR ENGINEERING & MFG. CO.,** Allentown, Pa.
UNITED IRON WORKS CO., 108 No. Locust, Pittsburg, Kans.
•**VULCAN IRON WORKS,** 700 So. Main St., Wilkes-Barre, Pa.
WEBBER EQUIPMENT CORP., 10 E. 44th St., New York 17, N. Y.

L

LABORATORY APPARATUS

THE BALDWIN LOCOMOTIVE WORKS, Philadelphia 42, Pa.
BURRELL CORP., 1942 Fifth Ave., Pittsburgh 19, Pa.
CAMBRIDGE INSTRUMENT CO., 3765 Grand Central Terminal, New York 17, N. Y.
CENTRAL SCIENTIFIC CO., 1700 Irving Park Rd., Chicago 13, Ill.
THE DENVER FIRE CLAY CO., 2301 Blake St., Denver 17, Colo.
•**EATON MANUFACTURING CO.,** 739 E. 140 St., Cleveland 10, Ohio
ELLISON DRAFT GAGE CO., 214 W. Kinzie St., Chicago 10, Ill.
FEDERAL CLASSIFIER SYSTEMS, INC., 127 N. Dearborn St., Chicago 2, Ill.
FISHER SCIENTIFIC CO., 717 Forbes St., Pittsburgh 19, Pa.
FORNEY'S INC., P.O. Box 310, New Castle, Pa.
•**GENERAL ELECTRIC CO.,** 1 River Road, Schenectady 5, N. Y.
GENERAL SCIENTIFIC EQUIPMENT CO., 27th & Huntingdon Sts., Philadelphia 32, Pa.
THE GILSON SCREEN CO., 119 E. Market St., Mercer, Pa.
•**HARDINGE CO., INC.,** 240 Arch St., York, Pa.
HUMBOLDT MFG. CO., 2014 N. Whipple St., Chicago 47, Ill.
LEEDS & NORTHRUP CO., 4970 Stenton Ave., Philadelphia 44, Pa.
MAGNETIC ENGINEERING & MFG. CO., 851 Van Houten Ave., Clifton, N. J.
MANNING, MAXWELL AND MOORE, INC., 250 East Main St., Stratford, Conn.
THE MINE & SMELTER SUPPLY CO., 1422 17th St., Denver 17, Colo.
NICHOLS ENGINEERING & RESEARCH CORP., 70 Pine Street, New York 5, N. Y.
NORTH AMERICA PHILIPS CO., INC., 100 E. 42nd Street, New York 17, N. Y.
PRECISION SCIENTIFIC CO., 3737 W. Cortland St., Chicago 47, Ill.
RAYMOND PULVERIZER DIV., COMBUSTION ENG. CO. INC., 1315 N. Branch St., Chicago 22, Ill.
STEARNS MAGNETIC MFG. CO. 675 S. 28th St., Milwaukee 46, Wis.
STURTEVANT MILL CO., 102 Clayton St., Boston 22, Mass.
THE W. S. TYLER CO., 3615 Superior Ave., Cleveland 14, O.
•**UNIVERSAL VIBRATING SCREEN CO.,** Deane Blvd. & St. Paul R.R., Racine, Wis.
CHARLES R. WATTS & CO., 4121 Sixth Ave., N.W., Seattle 7, Wash.
•**WESTERN MACHINERY CO.,** 760-766 Folsom St., San Francisco 7, Calif.
WESTINGHOUSE ELECTRIC CO., First Nat'l Bank Bldg., Pittsburgh, Pa.

LABORATORIES, Testing

THE GALIGHER COMPANY, 545 W. 8th South, Salt Lake City, Utah
THE GILSON SCREEN CO., 119 E. Market St., Mercer, Pa.
SEPARATION PROCESS CO., Fuller Bldg., Catasauqua, Pa.
STEARNS MAGNETIC MFG. CO., 675 S. 28th St., Milwaukee 46, Wis.
STURTEVANT MILL CO., 102 Clayton St., Boston 22, Mass.
•**UNIVERSAL VIBRATING SCREEN CO.,** Deane Blvd. & St. Paul R.R., Racine, Wis.
•**WESTERN MACHINERY CO.,** 760-766 Folsom St., San Francisco 7, Calif.
WESTINGHOUSE ELECTRIC CO., First Nat'l Bank Bldg., Pittsburgh, Pa.

LACING, Belt (see Belt Fasteners & Lacing)

LADDERS, Dredge

AMERICAN STEEL DREDGE CO., INC., 2511 Taylor St., Fort Wayne 6, Ind.
BETHLEHEM STEEL CO., 701 E. Third St., Bethlehem, Pa.
•**EAGLE IRON WORKS,** 137 Holcomb Ave., Des Moines 4, Iowa
ELLICOTT MACHINE CORP., 1611 Bush St., Baltimore 30, Md.
GREENVILLE MFG. WORKS, 1121½ W. Fourth St., Greenville, Ohio

LAUNDERS (see Chutes)

LIFT TRUCKS, Concrete Products, etc.

1. Gas
2. Electric
3. Gas-Electric

THE ATLAS CAR & MFG. CO., 1100 Ivanhoe Rd., Cleveland 10, Ohio
1—2
BAKER INDUSTRIAL TRUCK DIV., THE BAKER-RAULANG CO., 1250 W. 80th St., Cleveland 2, Ohio
1—2—3
BARRET-CRAVENS CO., 4613 S. Western Ave., Chicago 9, Ill.
•**BESSER MFG. CO.,** Alpena, Mich.
1—2—3
THE BUDA COMPANY, 154th & Commercial, Harvey, Ill.
1
CLARK EQUIPMENT CO., INDUSTRIAL TRUCK DIV., Springfield Pl., Battle Creek, Mich.
1—2—3
EASTON CAR & CONSTRUCTION CO., Easton, Pa.
2—3
•**ERICKSON POWER LIFT TRUCKS, INC.,** 1401 N. E. Marshall, Minneapolis 13, Minn.
1
ELWELL-PARKER ELECTRIC CO., 4205 St. Clair Ave., Cleveland 8, Ohio
1—2—3
•**FLEMING MFG CO.,** 4985 Fyler Ave., St. Louis 9, Mo.
GENERAL ENGINES CO., INC., 307 Hunter St., Gloucester, N. J.
1
GERLINGER CARRIER CO., Dallas, Oregon
1
•**THE FRANK G. HOUGH CO.,** Sunnyside Ave., Libertyville, Ill.
1
HYSTER CO., 2902 N. E. Clackamas, Portland 8, Ore.
1
•**THE KENT MACHINE CO.,** 1931 Thomas St., Cuyahoga Falls, Ohio
•**THE KNICKERBOCKER CO.,** 603 Liberty St., Jackson, Mich.
1
•**KWIK-MIX COMPANY,** 235 W. Grand Ave., Port Washington, Wis.
1
LEWIS-SHEPARD PRODUCTS INC., 206 Walnut St., Watertown 72, Mass.
1
•**LIFT TRUCKS INC.,** 2425 Spring Grove Ave., Cincinnati 14, Ohio
LULL MFG. CO., 3612 E. 44th St., Minneapolis 6, Minn.
1
MIXERMOBILE MANUFACTURERS, 6855 N. E. Halsey St., P. O. Box 5108, Portland 16, Ore.
REVOLVATOR CO., 86th St., at U. S. Rts. 1 and 9, North Bergen, N. J.
2—3
THE ROSS CARRIER CO., 140 Miller St., Benton Harbor, Mich.
SERVICE CASTER & TRUCK CORP., 500 N. Brownswood Ave., Albion, Mich.
1
SILENT HOIST & CRANE CO., 841 63rd St., Brooklyn 20, N. Y.
1
TOWMOTOR CO., 1226 E. 152nd St., Cleveland 10, Ohio
TRANSITIER TRUCK CO., 2477 N.W. 23rd Ave., Portland 10, Ore.
1
THE YALE & TOWNE MFG. CO., Philadelphia 15, Pa.
1—2—3

LIGHTERS, Fuse (see Blasting Supplies)

• A dot before name indicates advertiser in this issue. See advertiser index.

DIRECTORY

LIME KILNS (see Kilns)

LIME AND LIMESTONE SPREADERS

ANTHONY COMPANY, Streator, Ill.

•**BAUGHMAN MFG. CO.,** Jerseyville, Ill.

EVEN SPREAD CO., Owensville, Ohio

FLINK COMPANY, 502 N. Vermillion St., Streator, Ill.

HERCULES STEEL PRODUCTS CORP., Sherman St., Galion, Ohio

•**HIGHWAY EQUIPMENT CO. INC.,** 604 D, Ave., N.W., Cedar Rapids, Iowa

LIME MORTAR & PUTTY PLANTS

•**MILLER-KOMLINE,** Peapack, N. J.

SOUTHWESTERN ENGINEERING CO., 4800 Santa Fe Ave., Los Angeles 58, Calif.

LIME PLANTS

ARNOLD & WEIGEL DIV., TOLEDO ENGINEERING CO., INC., 958 Wall St., Toledo 6, Ohio

•**THE DORR CO. INC.,** Barry Pl., Stamford, Conn.

•**THE ELLERNAN CO.,** 203 Continental Bank Bldg., Salt Lake City 1, Utah

LIME INDUSTRY MANAGEMENT & ENGINEERING, Hershey, Pa.

•**LIPPMANN ENGINEERING WORKS,** 4603 W. Mitchell St., Milwaukee 14, Wis.

VICTOR J. NELSON ENG. CO., 1560 Victory Blvd., Glendale 1, Calif.

•**PETTIBONE-MULLIKEN CORP., IMPACT MASTER DIV.,** 4700 W. Division St., Chicago 51, Ill.

WM. E. ROBINSON & CO., 3633 Spring Garden St., Philadelphia 4, Pa.

•**SMITH ENGINEERING WORKS,** 532 E. Capitol Dr., Milwaukee 12, Wis.

SOUTHWESTERN ENGINEERING CO., 4800 Santa Fe Ave., Los Angeles 58, Calif.

STURTEVANT MILL CO., 102 Clayton St., Boston 22, Mass.

•**TRAYLOR ENGINEERING & MFG. CO.,** Allentown, Pa.

LINERS, Kiln (see Refractories)

LINERS, METAL, Grinding Mill

•**AMERICAN MANGANESE STEEL DIV. OF AMERICAN BRAKE SHOE CO.,** 401 E. 14th St., Chicago Heights, Ill.

ARNOLD AND WEIGEL DIV. TOLEDO ENGINEERING CO., INC., 958 Wall St., Toledo 6, Ohio

•**THE BABCOCK & WILCOX CO.,** 85 Liberty St., New York 6, N. Y.

CHICAGO STEEL FOUNDRY CO., 3720 S. Kedzie Ave., Chicago 32, Ill.

THE EIMCO CORP., P. O. Box 300, Salt Lake City 10, Utah

•**THE FROG, SWITCH & MFG. CO.,** Carlisle, Pa.

•**GARDNER-DENVER CO.,** Quincy, Ill.

GREENVILLE MFG. WORKS, 112½ W. Fourth St., Greenville, Ohio

HARDINGE CO., INC., 240 Arch St., York, Pa.

KENSINGTON STEEL CO., 505 Kensington St., Chicago 28, Ill.

MANGANESE STEEL FORGE CO., Richmond St. & Castor Ave., Philadelphia 34, Pa.

THE MINE & SMELTER SUPPLY CO., 1422 17th St., Denver 17, Colo.

•**F. L. SMIDTH & CO.,** 11 W. 42nd St., New York 18, N. Y.

•**TAYLOR-WHARTON IRON & STEEL CO.,** High Bridge, N. J.

•**THOMAS FOUNDRIES, INC.** P.O. Box 1111, Birmingham 1, Ala.

UNITED STATES STEEL CO., Pittsburgh 30, Pa.

LINERS, Pump, Metal

•**AMERICAN MANGANESE STEEL DIV. OF AMERICAN BRAKE SHOE CO.,** 377 E. 14th St., Chicago Heights, Ill.

CARVER PUMP CO., 1056 Hershey Ave., Muscatine, Iowa

CHICAGO STEEL FOUNDRY CO., 3720 So. Kedzie Ave., Chicago 32, Ill.

ELLICOTT MACHINE CORP., 1611 Bush St., Baltimore 30, Md.

•**THE FROG, SWITCH & MFG. CO.,** Carlisle, Pa.

GEORGIA IRON WORKS CO., 605 12th Street, Augusta, Ga.

THE MINE & SMELTER SUPPLY CO., 1422 17th St., Denver 17, Colo.

•**TAYLOR-WHARTON IRON & STEEL CO.,** High Bridge, N. J.

LINERS, Pump, Rubber

CARVER PUMP CO., 1056 Hershey Ave., Muscatine, Iowa

THE FIRESTONE TIRE & RUBBER CO., 1200 Firestone Pkway, Akron 17, Ohio

GOODALL RUBBER CO., Whitehead Road, Trenton 4, N. J.

•**THE GOODYEAR RUBBER TIRE CO.,** 1144 E. Market St., Akron, 16, Ohio

•**HEWITT RUBBER DIV. HEWITT-ROBINS INC.,** 240 Kensington Ave., Buffalo 5, N. Y.

THE MINE & SMELTER SUPPLY CO., 1422 17th St., Denver 17, Colo.

QUAKER RUBBER CORP., Tacony and Comly Sts., Philadelphia 24, Pa.

RAYBESTOS - MANHATTAN, INC., 61 Willett St., Passaic, N. J.

UNITED STATES RUBBER CO., 1230 Ave. of the Americas, New York 20, N. Y.

LININGS, CHUTE (see Chute Linings)

LOADERS

1. **Boat**
2. **Car**
3. **Truck**

BARRETT-CRAVENS CO., 4613 S. Western Blvd., Chicago 9, Ill.
3

BONDED SCALE & MACHINE CO., 41 Bellview Ave., Columbus 7, Ohio
1—2—3

•**DIAMOND IRON WORKS, INC.,** 1728 North 2nd St., Minneapolis 11, Minn.
3

EAGLE CRUSHER CO., INC., 900 Harding Way E., Galion, Ohio
3

THE EIMCO CORP., P. O. Box 300, Salt Lake City 10, Utah
2—3—4

GODFREY CONVEYOR CO., 13th and Wolf Ave., Elkhart, Ind.
2—3

GEORGE HAISS MFG. CO., Park Ave. & 143rd St., New York 51, N. Y.
1—2—3

HENNEUSE ENGINEERING CO., Marion, Ohio

•**ROBINS CONVEYORS DIV., HEWITT-ROBINS INC.,** 270 Passaic Ave., Passaic, N. J.
1

•**THE FRANK G. HOUGH CO.,** Sunnyside Ave., Libertyville, Ill.
2—3

HYSTER CO., 2918 N. E. Clackamas, Portland 8, Ore.
1—2—3

LEWIS - SHEPARD PRODUCTS, INC., 206 Walnut St., Watertown 72, Mass.
3

•**LIPPMANN ENGINEERING WORKS,** 4603 W. Mitchell St., Milwaukee 14, Wis.
1—2—3

LULL MFG. CO., 3612 E. 44th St., Minneapolis 6, Minn.
1—2

MIXERMOBILE MANUFACTURERS, 6855 N. E. Halsey St., P. O. Box 5108, Portland 16, Ore.
2—3

O. K. CLUTCH & MACHINERY CO., Florence St., Columbia, Pa.
3

OTTUMWA BOX CAR LOADER CO., P.O. Box 417, Ottumwa, Iowa
2

•**PETTIBONE MULLIKEN CORP.,** 4710 W. Division St., Chicago 51, Ill.
3

REVOLVATOR CO., 86th St. at U. S. Rts. 1 and 9, North Bergen, N. J.
3

•**SCHIELD-BANTAM CO.,** 216 Park St., Waverly, Iowa

THE SINK AND FLOAT CORP., Empire State Bldg., New York 1, N. Y.

STEPHENS-ADAMSON MFG. CO., 7 Ridgeway Ave., Aurora, Ill.
1—2—3

TRACTOMOTIVE CORP., County Line Road, Deerfield, Ill.
2—3

TRIANGLE ENGINEERING CO., 2848 W. 26th St., Chicago 23, Ill.
3

TROWBRIDGE CONVEYOR CO., 860 Van Houten Ave., Clifton N. J.
2—3

LOADERS

1. **Tractor**
2. **Underground**

•**ALLIS-CHALMERS MFG. CO., TRACTOR DIVISION,** P. O. Box 512, Milwaukee 1, Wis.
1

ATHEY PRODUCTS CORP., 5631 W. 65th St., Chicago 38, Ill.
1

•**BUCYRUS-ERIE CO.,** South Milwaukee, Wis.
1

•**BUTLER BIN CO.,** Box 407, Waukesha, Wis.
1

CONSTRUCTION PRODUCTS CORP., 410 San Fernando Road, Los Angeles 31, Calif.
1

THE EIMCO CORP., P. O. Box 300, Salt Lake City 10, Utah
1—2

•**GARDNER-DENVER CO.,** Quincy, Ill.
2

•**THE FRANK G. HOUGH CO.,** Sunnyside Ave., Libertyville, Ill.
1

THE JEFFREY MFG. CO., 935 N. 4th St., Columbus 16, Ohio
2

•**JOY MANUFACTURING CO.,** Henry W. Oliver Bldg., Pittsburgh 22, Pa.
2

THE KENT MACHINE CO., 1931 Thomas St., Cuyahoga Falls, O.
2

LESSMANN MANUFACTURING CO., 20th & Easton Blvd., Des Moines 4, Iowa

LULL MFG. CO., 3612 E. 44th St., Minneapolis 6, Minn.
1

MAINE STEEL INC., South Windham, Me.
1

MANDT MFG. CO., 490 W. Goodale St., Columbus 8, Ohio
1

THE OLIVER CORP., INDUSTRIAL DIV., 19300 Euclid Ave., Cleveland 17, Ohio
1

OTTAWA STEEL PRODUCTS CO., Ottawa, Kansas
1

ROGERS IRON WORKS CO., 11th & Pearl Sts., Joplin, Mo.
2

SHEPPARD DIESELS, Philadelphia St., Hanover, Pa.
1

•**TRACKSON COMPANY,** 3333 S. Chase Ave., Milwaukee 7, Wis.
1

TRACTOMOTIVE CORP., County Line Road, Deerfield, Ill.
1

UNITED IRON WORKS CO., 108 No. Locust, Pittsburg, Kans.
2

LOCOMOTIVES

1. **Diesel**
2. **Electric**
3. **Gasoline**
4. **Oil (L.P.G.)**
5. **Storage Battery**

ATLAS CAR & MFG. CO., 1100 Ivanhoe Rd., Cleveland 10, Ohio
2—5

THE BALDWIN LOCOMOTIVE WORKS, Philadelphia 42, Pa.
1—2—3

DAVENPORT BESLER CORP., 2305 Rockingham Rd., Davenport, Iowa
1—2—3—4—5

DIFFERENTIAL STEEL CAR CO., Findlay, Ohio
1—2

THE FATE-ROOT-HEATH CO., Plymouth, Ohio
1—2—3

•**GENERAL ELECTRIC CO.,** 1 River Road, Schenectady 5, N. Y.
2—5

INTERNATIONAL DIESEL ELECTRIC CO., INC., 13-02 44th Ave., Long Island City 1, N. Y.
1—3

THE JEFFREY MFG. CO., 935 N. 4th St., Columbus 16, Ohio
2—5

MIDWEST STEEL CORP., Charleston 2, W. Va.
1—3

H. K. PORTER CO., INC., 49th & Harrison Sts., Pittsburgh 1, Pa.
1—2—3—4—5

PRESSED STEEL CAR CO., INC., 25 Broad St., New York 4, N. Y.
1—2—3—4—5

•**VULCAN IRON WORKS,** 700 So. Main St., Wilkes-Barre, Pa.
1—2—3—4—5

WESTINGHOUSE ELECTRIC CO., First Nat'l Bank Bldg., Pittsburgh, Pa.
1—2—5

•**THE WHITCOMB LOCOMOTIVE CO., DIV OF BALDWIN LIMA HAMILTON CORPORATION,** Eddystone, Pa.
1—2—3

• A dot before name indicates advertiser in this issue. See advertiser index.

DIRECTORY

LOCOMOTIVES

1. Diesel-Electric
2. Gasoline-Electric
3. Oil (L.P.G.)-Electric

THE BALDWIN LOCOMOTIVE WORKS, Philadelphia 42, Pa.
1—2

DAVENPORT BESLER CORP., 2305 Rockingham Rd., Davenport, Iowa
1—2—3

DIFFERENTIAL STEEL CAR CO., Findlay, Ohio
1

THE FATE-ROOT-HEATH CO., Plymouth, Ohio
1

●**GENERAL ELECTRIC CO.,** 1 River Road, Schenectady 5, N. Y.
1—2

GREENVILLE MFG. WORKS, 112½ W. Fourth St., Greenville, Ohio
1

H. K. PORTER CO., INC., 49th & Harrison Sts., Pittsburgh 1, Pa.
1—2—3

PRESSED STEEL CAR CO., INC., 25 Broad St., New York 4, N. Y.
1—2—3

●**VULCAN IRON WORKS,** 700 So. Main St., Wilkes-Barre, Pa.
1—2—3

WESTINGHOUSE ELECTRIC CO., First Nat'l Bank Bldg., Pittsburgh, Pa.
1—2—3

●**THE WHITCOMB LOCOMOTIVE CO., DIV OF BALDWIN LIMA HAMILTON CORPORATION,** Eddystone, Pa.
1—2

LOG WASHERS, Aggregates (see Scrubbers)

LORRIES, WEIGH *(see Weigh Lorries)*

LUBRICANTS, Grease, Oil, etc.

JOSEPH DIXON CRUCIBLE CO., 167 Wayne St., Jersey City 3, N. J.

DOW CORNING CORP., Midland, Mich.

LUBRIPLATE DIV., FISKE BROS. REFINING CO., 129 Lockwood St., Newark 5, N. J.

GAR-BRO MFG. CO., 2416 E. 16th St., Los Angeles 21, Calif.

●**GULF OIL CORP.,** Gross St. & P. R. R., Pittsburgh 6, Pa.

E. F. HOUGHTON & CO., 303 W. Lehigh Ave., Philadelphia 33, Pa.

KEYSTONE LUBRICATING CO., 21st & Lippincott Sts., Philadelphia 32, Pa.

MACMILLAN PETROLEUM CORP., 530 W. Sixth St., Los Angeles 14, Calif.

THE PURE OIL CO., 35 E. Wacker Drive, Chicago 1, Ill.

SHELL OIL COMPANY, 50 W. 50th St., New York 20, N. Y.

SINCLAIR REFINING CO., 630 Fifth Ave., New York 20, N. Y.

SOCONY-VACUUM OIL CO., 26 Broadway, New York 4, N. Y.

L. SONNEBORN SONS, INC., 300 Fourth Ave., New York 10, N. Y.

STANDARD OIL CO. OF CALIF., 225 Bush St., San Francisco 20, Calif.

STANDARD OIL OF INDIANA, 910 S. Michigan Ave., Chicago 5, Ill.

STANDARD OIL CO. (NEW JERSEY), 15 W. 51st St., New York 19, N. Y.

STEWART-WARNER CORP., 1826 W. Diversey Parkway, Chicago 14, Ill.

SUN OIL CO., 1608 Walnut St., Philadelphia, Pa.

SWAN-FINCH OIL CO., 30 Rockefeller Plaza, New York, N. Y.

●**THE TEXAS CO.,** 135 E. 42nd St., New York 17, N. Y.

TIDE WATER ASSOCIATED OIL CO., 17 Battery Pl., New York 4, N. Y.

THE WHITMORE MFG. CO., Box 1640, Station C, Cleveland 4, Ohio

LUBRICANTS, Wire Rope

AMERICAN STEEL & WIRE CO., Rockefeller Bldg., Cleveland 13, Ohio

DAYBROOK HYDRAULIC CORP., 500 Lehman Ave., Bowling Green, Ohio

JOSEPH DIXON CRUCIBLE CO., 167 Wayne St., Jersey City 3, N. J.

LUBRIPLATE DIV., FISKE BROS. REFINING CO., 129 Lockwood St., Newark 5, N. J.

GREDAG, INC., Gluck Building, Room 202, Niagara Falls, N. Y.

●**GULF OIL CORPORATION,** Gulf Building, Pittsburgh 30, Pa.

E. F. HOUGHTON & CO., 303 W. Lehigh Ave., Philadelphia 33, Pa.

KEYSTONE LUBRICATING CO., 21st & Lippincott Sts., Philadelphia 32, Pa.

A. LESCHEN & SONS ROPE CO., 5909 Kennerly Ave., St. Louis 12, Mo.

MACMILLAN PETROLEUM CORP., 530 W. Sixth St., Los Angeles 14, Calif.

●**MACWHYTE CO.,** 2949 14th Ave., Kenosha, Wis.

THE PURE OIL CO., 35 E. Wacker Drive, Chicago 1, Ill.

ROCHESTER ROPES INC., Culpeper, Va.

JOHN A. ROEBLING'S SONS CO., 640 S. Broad St., Trenton 2, N. J.

SHELL OIL COMPANY, 50 W. 50th St., New York 20, N. Y.

STANDARD OIL OF INDIANA, 910 S. Michigan Ave., Chicago 5, Ill.

STEWART-WARNER CORP., 1826 W. Diversey Parkway, Chicago 14, Ill.

SUN OIL CO., 1608 Walnut St., Philadelphia, Pa.

●**THE TEXAS CO.,** 135 E. 42nd St., New York 17, N. Y.

TIDE WATER ASSOCIATED OIL CO., 17 Battery Pl., New York 4, N. Y.

THE WHITMORE MFG. CO., Box 1640, Station C, Cleveland 4, Ohio

LUBRICATING SYSTEMS

THE CLEVELAND WORM AND GEAR CO., 3249 E. Eightieth St., Cleveland 4, Ohio

GRAY COMPANY, INC., 60 Eleventh Ave., N. E., Minneapolis 13, Minn.

KEYSTONE LUBRICATING CO., 21st & Lippincott Sts., Philadelphia 32, Pa.

LINCOLN ENGINEERING CO., 5701 Natural Bridge, St. Louis 20, Mo.

OIL-RITE CORP., 3466 S. 13th St., Milwaukee 15, Wis.

THE RUCHER CO., 4228 Hollis St., Oakland 8, Calif.

STEWART-WARNER CORP., 1826 W. Diversey Parkway, Chicago 14, Ill.

M

MAGNETIC SEPARATORS

AMERICAN CYANAMID CO., 30 Rockefeller Plaza, New York 20, N. Y.

ANCHOR CONCRETE MACHINERY CO., 1191 Fairview Ave., Columbus 12, Ohio

THE C. O. BARTLETT AND SNOW CO., 6200 Harvard Ave., Cleveland 5, Ohio

CARBOLOY DEPT. GENERAL ELECTRIC CO., 11177 E. Eight Mile Rd., Detroit 32, Mich.

CONTINENTAL GIN CO., P. O. Box 2614, Birmingham, Ala.

THE CONVEYOR CO., 3260 East Slauson Ave., Los Angeles 11, Calif.

DINGS MAGNETIC SEPARATOR CO., 509 E. Smith St., Milwaukee, Wis.

THE ELECTRIC CONTROLLER & MFG. CO., 2700 E. 79th St., Cleveland 4, Ohio

ERIEZ MANUFACTURING CO., 631 Commerce Bldg., Erie, Pa.

GALENA MACHINE & ELECTRIC CO., 209-11 Main St., Galena, Kans.

GREENVILLE MFG. WORKS, 112½ W. Fourth St., Greenville, Ohio

HONAN-CRANE CORP., Lebanon, Ind.

THE JEFFREY MFG. CO., 935 N. 4th St., Columbus 16, Ohio

MAGNETIC ENGINEERING & MFG. CO., 851 Van Houten Ave., Clifton, N. J.

PULVERIZING MACHINERY CO., Chatham Road, Summit, N. J.

SEPARATIONS ENGINEERING CORP., 110 E. 42nd St., New York 17, N. Y.

STEARNS MAGNETIC MFG. CO., 675 S. 28th St., Milwaukee 46, Wis.

STEARNS-ROGERS MFG. CO., 1720 California St., Denver 2, Colo.

MASONRY COLORS (see Cement and Masonry Colors)

MASONRY SAWS

CHAMPION MANUFACTURING CO., 2028 Washington Ave., St. Louis 3, Mo.

●**CLIPPER MFG. CO.,** 2807 Warwick, Kansas City 8, Mo.

CONSTRUCTION MACHINERY CO'S., Glenwood & Vinton Sts., Waterloo, Iowa

FLEMING MFG. CO., 4985 Fyler Ave., St. Louis, Mo.

STONE MACHINERY CO., INC., 399 Fayette St., Manlius, N. Y.

VICTOR ENGINEERING CORP., 27 Maplewood Ave., Philadelphia 44, Pa.

MEASURING DEVICES

1. Weight
2. Volumetric (See Batchers)

CONCRETE TRANSPORT MIXER CO., 4985 Fyler Ave., St. Louis 9, Mo.
1—2

CONSTRUCTION MACHINERY CO'S., Glenwood & Vinton Sts., Waterloo, Iowa
1—2

THE CONVEYOR CO., 3260 East Slauson Ave., Los Angeles 11, Calif.
1

●**FLEMING MFG. CO.,** 4985 Fyler Ave., St. Louis 9, Mo.
1—2

●**THE C. S. JOHNSON CO.,** P.O. Box 71, Champaign, Ill.
1—2

NICHOLS ENG. & RESEARCH CORP., 70 Pine St., New York 5, N. Y.
1

NOBLE CO., 1860 Seventh St., Oakland 20, Calif.
1

SCIENTIFIC CONCRETE SERVICE CORP., 724 Salem Ave., Elizabeth 3, N. J.
1

●**SYNTRON CO.,** 450 Lexington, Homer City, Pa.
1

SINTERING MACHINERY CORP., Netcong, N. J.
1—2

CHARLES R. WATTS & CO., 4121 Sixth Ave. N. W., Seattle 7, Wash.
1

METERS

1. Electric
2. Water
3. Other Fluids

AUTOLENE LUBRICANTS CO., PROTEX DIVN., 1331 W. Evans Ave., Denver 9, Colo.
3

AUTOMATIC LIQUID METER CO., 1372-1378 E. 15th St., Los Angeles 21, Calif.
2—3

B. F. M. INDUSTRIES, INC., 2124 Mill Ave., Brooklyn 34, N. Y.
1

●**BAILEY METER CO.,** 1050 Ivanhoe Road, Cleveland 10, Ohio
2—3

THE BRISTOL CO., Waterbury 20, Conn.
1—2—3

BUILDERS-PROVIDENCE, INC., 345 Harris Ave., Providence 1, R. I.
2—3

THE FOXBORO CO., Neponset Ave., Foxboro, Mass.
3

●**GENERAL ELECTRIC CO.,** 1 River Road, Schenectady 5, N. Y.
1

GREENVILLE MFG. WORKS, 112½ W. Fourth St., Greenville, Ohio

THE HAYS CORP., East 8th St., Michigan City, Ind.
1—2—3

METHERINGTON & BERNER INC., 701-745 Kentucky Ave., Indianapolis 7, Ind.
2—3

MINNEAPOLIS - HONEYWELL REGULATOR CO., BROWN INSTRUMENTS DIV., Wayne and Roberts Aves., Philadelphia 44, Pa.
2—3

NEPTUNE METER CO., 50 W. 50th St., New York 20, N. Y.
2—3

WESTINGHOUSE ELECTRIC CO., First Nat'l Bank Bldg., Pittsburgh, Pa.
1

WORTHINGTON PUMP & MACHINERY CORP., Worthington Ave., Harrison, N. J.
2—3

MILLS, Grinding

1. Ball
2. Compartment
3. Laboratory
4. Rod
5. Roll
6. Tube

ABBE ENGINEERING CO., 50 Church St., New York 7, N. Y.
1—3—6

ALLEN CONE & MACHINERY CORP., 120 Broadway, New York 5, N. Y.
1—4

●**ALLIS-CHALMERS MFG. CO.,** 975 So. 70th St., Milwaukee 1, Wisc.
1—2—4—5—6

● A dot before name indicates advertiser in this issue. See advertiser index.

DIRECTORY

●**AMERICAN PULVERIZER CO.,** 1249 Macklind Ave., St. Louis 10, Mo.
3

●**THE BABCOCK & WILCOX CO.,** 85 Liberty St., New York 6, N. Y.
1

THE BONNOT CO., 722 Mulberry S.E., Canton 2, Ohio
1—4

BRADLEY PULVERIZER CO., 123 S. Third St., Allentown, Pa.
5

●**DENVER EQUIPMENT CO.,** 1410 Seventeenth St., Denver 17, Colo.
1—3—4

EAGLE CRUSHER CO., INC., 900 Harding Way E., Galion, Ohio
1—2—3—4—5—6

THE EIMCO CORP., P. O. Box 300, Salt Lake City 10, Utah
1—4

GREENVILLE MFG. WORKS, 112½ W. Fourth St., Greenville, Ohio

●**HARDINGE CO., INC.,** 240 Arch St., York, Pa.
1—2—4—6

●**KENNEDY VAN SAUN MFG. & ENG. CORP.,** 2 Park Ave., New York 16, N. Y.
1—2—3—4—5—6

THE MINE & SMELTER SUPPLY CO., 1422 17th St., Denver 17, Colo.
1—3—4—6

MORSE BROS. MACHINERY CO., 2900 Brighton Blvd., Denver 1, Colo.
1—3—4—6

●**NORDBERG MFG. CO.,** 3073 So. Chase Ave., Milwaukee 7, Wis.
1—2—4—5—6

THE PATTERSON FOUNDRY & MACHINE CO., 1250 St. George St., East Liverpool, Ohio
1—3—4—6

PENNSYLVANIA CRUSHER CO., Liberty Trust Bldg., Philadelphia 7, Pa.
3—5

H. K. PORTER CO., INC., 49th & Harrison Sts., Pittsburgh 1, Pa.
1—2—3—4—5—6

PULVERIZING MACHINERY CO., Chatham Road, Summit, N. J.
2—3

●**RAYMOND PULVERIZER DIV., COMBUSTION ENG. CO., INC.,** 1315 N. Branch St., Chicago 22, Ill.
3—4

●**F. L. SMIDTH & CO.,** 11 W. 42nd St., New York 18, N. Y.
1—2—3—5

STEARNS-ROGERS MFG. CO., 1720 California St., Denver 2, Colo.
1—2—3—4

STEDMAN FOUNDRY & MACHINE CO., INC., Indiana Ave., Aurora, Ind.
5

STRAUB MFG. CO., 456 Chestnut St., Oakland 7, Calif.
1—3—6

STURTEVANT MILL CO., 102 Clayton St., Boston 22, Mass.
3—5

●**TRAYLOR ENGINEERING & MFG. CO.,** Allentown, Pa.
1—2—4—6

UNITED STATES STEEL CO., 525 William Penn Place, Pittsburgh 30, Pa.

●**WILLIAMS PATENT CRUSHER & PULV CO.,** 2701 N. Broadway, St. Louis 6, Mo.
3

MILLS, Washing (see Scrubbers)

MILLS, Hammer (see Crushers, Hammer)

MIXER BODIES, Truck (see Bodies)

MIXERS, Concrete (see Concrete Mixers)

MIXERS, Plaster & Mortar

BETHLEHEM STEEL CO., 701 E. Third St., Bethlehem, Pa.

●**CHAIN BELT CO.,** 1600 W. Bruce St., Milwaukee 4, Wis.

CHASE CONCRETE MACHINERY CO., 94 Grandview Ave., Buffalo 23, N. Y.

CONSTRUCTION MACHINERY CO'S., Glenwood & Vinton Sts., Waterloo, Iowa

GILSON BROTHERS CO., Fredonia, Wis.

●**THE JAEGER MACHINE CO.,** 550 W. Spring St., Columbus 16, Ohio

●**THE KNICKERBOCKER CO.,** 603 Liberty St., Jackson, Mich.

●**KWIK-MIX COMPANY,** 235 W. Grand Ave., Port Washington, Wis.

MULTIPLEX MACHINERY CORP., Elmore, Ohio

NOVERA, INC., 420 Lexington Ave., New York 17, N. Y.

●**STEARNS MFG. CO.,** 600 E. Beecher St., Adrian, Mich.

WORTHINGTON PUMP & MACHINERY CORP., Worthington Ave., Harrison, N. J.

MIXERS, Pugmill

BETHLEHEM STEEL CO., 701 E. Third St., Bethlehem, Pa.

BODINSON MFG. CO., 2401 Bayshore Blvd., San Francisco 24, Calif.

THE BONNOT CO., 722 Mulberry S.E., Canton 2, Ohio

HETHERINGTON & BERNER INC., 701-745 Kentucky Ave., Indianapolis 7, Ind.

●**IOWA MFG. CO.,** 916 16th St., N.E., Cedar Rapids, Iowa

●**KWIK-MIX CO.,** 235 W. Grand Ave., Port Washington, Wis.

●**LINK-BELT COMPANY,** 300 W. Pershing Rd., Chicago 9, Ill.

MADSEN IRON WORKS, INC., 5631 Bickett St., Huntington Park, Calif.

MANGANESE STEEL FORGE CO., Richmond St. & Castor Ave., Philadelphia 34, Pa.

NICHOLS ENGINEERING & RESEARCH CORP., 70 Pine Street, New York 5, N. Y.

THE PATTERSON FOUNDRY & MACHINE CO., 1250 St. George St., East Liverpool, Ohio

●**W. A. RIDDELL CORP.,** Bucyrus, Ohio

SIMPLICITY SYSTEM CO., Riverside Dr., Chattanooga 6, Tenn.

SINTERING MACHINERY CORP., Netcong, N. J.

SPROUT, WALDRON & CO., INC., Muncy, Pa.

●**STEARNS MFG. CO.,** 600 E. Beecher St., Adrian, Mich.

J. C. STEELE & SONS, INC., North Mulberry, Statesville, N.C.

UNITED IRON WORKS CO., 108 No. Locust, Pittsburg, Kans.

MIXERS, Slurry (see Slurry Mixers)

MONITORS, Hydraulic

GEORGIA IRON WORKS CO., 605 12th St., Augusta, Ga.

MORTAR COLORS (see Cement & Masonry Colors)

MOTOR TRACTORS, Off-Highway

1. Diesel
2. Gas

●**CATERPILLAR TRACTOR CO.,** Peoria 8, Ill.
1

THE EUCLID ROAD MCHNRY. CO., 1361 Chardon Road, Cleveland 17, Ohio
1

INTERNATIONAL HARVESTER CO., 180 N. Michigan Ave., Chicago 1, Ill.
1—2

●**KOEHRING CO.,** 3026 W. Concordia Ave., Milwaukee 16, Wis.
1—2

LULL MFG. CO., 3612 E. 44th St., Minneapolis 6, Minn.
1—2

M-R-S MANUFACTURING CO., P.O. Box 336, Flora, Miss.
1

●**MACK MFG. CORP.,** 350 Fifth Ave., New York 1, N. Y.
1—2

MARMON - HERRINGTON CO., INC., 1511 W. Washington St., Indianapolis 7, Ind.
1—2

MINNEAPOLIS-MOLINE CO., P. O. Box 1050, Minneapolis 1, Minn.
2

WALTER MOTOR TRUCK CO., 1001 Irving Ave., Ridgewood, L. I., N. Y. (Brooklyn P. O.)
1—2

STERLING MOTORS DIV., THE WHITE MOTOR CO., 2021 S. 54th, Milwaukee, Wis.
2

THE WHITE MOTOR CO., 842 E. 79th St., Cleveland 1, Ohio
1—2

WOOLDRIDGE MANUFACTURING CO., Sunnyvale, Calif.

MOTOR TRUCK CONCRETE MIXERS (see Bodies)

MOTOR TRUCK DRIVES AND DIFFERENTIALS, Special

●**COOK BROS. EQUIPMENT CO.,** 1815 N. Broadway, Los Angeles 31, Calif.

DAVEY COMPRESSOR CO., N. Water & Saginor Sts., Kent, Ohio

DETROIT AUTOMOTIVE PRODUCTS CORP., 8701 Grinnell Ave., Detroit 13, Mich.

DUPLEX TRUCK CO., 830 E. Hazel St., Lansing 4, Mich.

EATON MANUFACTURING CO., 739 East 140th St., Cleveland, Ohio

KENWORTH MOTOR TRUCK CORP., 8801 E. Marginal Way, Seattle 11, Wash.

MARMON - HERRINGTON CO., INC., 1511 W. Washington St., Indianapolis 7, Ind.

TRUCK EQUIPMENT CO. INC., 1791 Fillmore Ave., Buffalo 14, N. Y.

TRUCKSTELL MANUFACTURING CO., 1435 Union Commerce Bldg., Cleveland 14, Ohio

MOTOR TRUCKS, Highway

AUTOCAR CO., Ardmore, Pa.

CHEVROLET MOTOR CO., General Motors Bldg., Detroit 2, Mich.

●**COOK BROS., EQUIPMENT CO.,** 1815 N. Broadway, Los Angeles 31, Calif.

DART TRUCK CO., Oak at 27th Sts., Kansas City 8, Mo.

DIAMOND T. MOTORTRUCK CO., 4517 W. 26th St., Chicago 23, Ill.

●**DODGE DIVISION, CHRYSLER CORP.,** 7900 Jos. Campeau St., Detroit 31, Mich.

DUPLEX TRUCK CO., 830 E. Hazel St., Lansing 5, Mich.

FEDERAL MOTOR TRUCK CO., 5780 Federal Ave., Detroit 9, Mich.

FORD MOTOR CO., Administration Bldg., Dearborn, Mich.

THE FOUR WHEEL DRIVE AUTO CO., Clintonville, Wis.

G. M. C. TRUCK & COACH DIV., YELOW TRUCK & COACH MFG CO., South Blvd., Pontiac 11, Mich.

INTERNATIONAL HARVESTER CO., 180 N. Michigan Ave., Chicago 1, Ill.

KENWORTH MOTOR TRUCK CORP., 8801 E. Marginal Way, Seattle 11, Wash.

●**MACK MFG. CORP.,** 350 Fifth Ave., New York 1, N. Y.

REO MOTORS, INC., 1331 So. Washington Ave., Lansing, Mich.

SIX WHEELS INC., 20th & Compton, Los Angeles, Calif.

STERLING DIV., THE WHITE MOTOR CO., 2021 So. 54th St., Milwaukee 1, Wis.

TRUCKSTELL MANUFACTURING CO., 1435 Union Commerce Bldg., Cleveland 14, Ohio

THE WHITE MOTOR CO., 842 E. 79th St., Cleveland 1, Ohio

WILLYS-OVERLAND MOTORS, INC., North Cove Blvd., Toledo 1, Ohio

MOTOR TRUCKS, Off-Highway End, Side, Bottom, Dump, Etc.

AUTOCAR CO., Ardmore, Pa.

●**BAUGHMAN MFG. CO., INC.,** 1000 Shipman Road, Jerseyville, Ill.

CHEVROLET MOTOR CO., General Motors Bldg., Detroit 2, Mich.

●**COOK BROS. EQUIPMENT CO.,** 1815 N. Broadway, Los Angeles 31, Calif.

DAYBROOK HYDRAULIC CORP., 500 Lehman Ave., Bowling Green, Ohio

DIAMOND T. MOTORTRUCK CO., 4517 W. 26th St., Chicago 23, Ill.

EASTON CAR & CONSTRUCTION CO., Easton, Pa.

●**THE EUCLID ROAD MCHNRY. CO.,** 1361 Chardon Road, Cleveland 17, Ohio

FEDERAL MOTOR TRUCK CO., 5780 Federal Ave., Detroit 9, Mich.

FORD MOTOR CO., Administration Bldg., Dearborn, Mich.

THE FOUR WHEEL DRIVE AUTO CO., Clintonville, Wis.

G. M. C. TRUCK & COACH DIV., YELOW TRUCK & COACH MFG. CO., South Blvd., Pontiac 11, Mich.

INTERNATIONAL HARVESTER CO., 180 N. Michigan Ave., Chicago 1, Ill.

KENWORTH MOTOR TRUCK CORP., 8801 E. Marginal Way, Seattle 11, Wash.

●**KOEHRING CO.,** 3026 W. Concordia Ave., Milwaukee 16, Wis.

●**R. G. LeTOURNEAU, INC.,** 2301 N. Adams St., Peoria, Ill.

●**MACK MFG. CORP.,** 350 Fifth Ave., New York 1, N. Y.

MARMON - HERRINGTON CO., INC., 1511 W. Washington St., Indianapolis 7, Ind.

REO MOTORS, INC., 1331 So. Washington Ave., Lansing, Mich.

● A dot before name indicates advertiser in this issue. See advertiser index.

DIRECTORY

●**SCHONROCK EQUIPMENT MFG. CO.**, P.O. Box 1543, San Angelo, Texas

STERLING DIV., THE WHITE MOTOR CO., 2021 SO. 54th St., Milwaukee 1, Wis.

TRUCK EQUIPMENT CO., INC., 1791 Fillmore Ave., Buffalo 14, N. Y.

TRUCKSTELL MANUFACTURING CO., 1435 Union Commerce Bldg., Cleveland 14, Ohio

WALTER MOTOR TRUCK CO., 1001 Irving Ave., Ridgewood, L. I., N. Y. (Brooklyn P. O.)

WILLYS - OVERLAND MOTORS, INC., North Cove Blvd., Toledo 1, Ohio

THE WHITE MOTOR CO., 842 E. 79th St., Cleveland 1, Ohio

WOOLDRIDGE MFG. CO., Sunnyvale, Calif.

MOTOR TRUCK TRACTORS, Highway

1. Diesel
2. Gasoline

AUTOCAR CO., Adrmore, Pa.
2

CHEVROLET MOTOR CO., General Motors Bldg., Detroit 2, Mich.
2

●**COOK BROS. EQUIPMENT CO.**, 1815 N. Broadway, Los Angeles 31, Calif.
1—2

DIAMOND T. MOTORTRUCK CO., 4517 W. 26th St., Chicago 23, Ill.
2

DUPLEX TRUCK CO., 830 E. Hazel St., Lansing 5, Mich.
1—2

THE EIMCO CORP., P.O. Box 300, Salt Lake City 8, Utah
1—2

FEDERAL MOTOR TRUCK CO., 5780 Federal Ave., Detroit 9, Mich.
1—2

FORD MOTOR CO., Administration Bldg., Dearborn, Mich.
2

THE FOUR WHEEL DRIVE AUTO CO., Clintonville, Wis.
1—2

G. M. C. TRUCK & COACH DIV., YELOW TRUCK & COACH MFG. CO., South Blvd., Pontiac 11, Mich.
1—2

INTERNATIONAL HARVESTER CO., 180 N. Michigan Ave., Chicago 1, Ill.
1—2

KENWORTH MOTOR TRUCK CORP., 8801 E. Marginal Way, Seattle 11, Wash.
1—2

M-R-S MANUFACTURING CO., P.O. Box 336, Flora, Miss.
1

●**MACK MFG. CORP.**, 350 Fifth Ave., New York 1, N. Y.
1—2

REO MOTORS, INC., 1331 So. Washington Ave., Lansing, Mich.
2

SIX WHEELS, INC., 20th & Compton, Los Angeles, Calif.

STERLING DIV., THE WHITE MOTOR CO., 2021 So. 54th St., Milwaukee 1, Wis.
1—2

TRUCKSTELL MANUFACTURING CO., 1435 Union Commerce Bldg., Cleveland 14, Ohio

THE WHITE MOTOR CO., 842 E. 79th St., Cleveland 1, Ohio
1—2

MOTORS (see Electric Motors)

N

NOZZLES, Spray

●**BOSTON WOVEN HOSE & RUBBER CO.**, P.O. Box 1071, Boston 3, Mass.

BUFFALO FORGE CO., 490 Broadway, Buffalo 5, N. Y.

CARLYLE RUBBER CO., INC., 62-66 Park Pl., New York 7, N. Y.

●**CHAIN BELT CO.**, 1600 W. Bruce St., Milwaukee 4, Wis.

COLORCRETE INDUSTRIES, INC., 24th & Ottawa Ave., Holland, Mich.

THE DEISTER CONCENBRATOR CO., 935 Glascow Ave., Fort Wayne 1, Ind.

●**DEISTER MCH.**, East Wayne St., Ft. Wayne 4, Ind.

THE DeVILBISS CO., 300 Phillips Ave., Toledo 1, Ohio

●**IOWA MFG. CO.**, 916 16th St. N. E., Cedar Rapids, Iowa

LINCOLN ENGINEERING CO., 5701 Natural Bridge, St. Louis 20, Mo.

●**LINK-BELT COMPANY**, 300 W. Pershing Rd., Chicago 9, Ill.

●**NEW HAVEN VIBRATOR CO.**, 145 Chestnut St., New Haven 7, Conn.

SPRAYING SYSTEMS CO., 3201 Randolph St., Bellwood, Ill.

●**YUBA MFG. CO.**, 351 California St., San Francisco 4, Cal.

NOZZLES, Washing

ALLEN CONE & MACHINERY CORP., 120 Broadway, New York 5, N. Y.

CARLYLE RUBBER CO., INC., 62-66 Park Pl., New York 7, N. Y.

●**CHAIN BELT CO.**, 1600 W. Bruce St., Milwaukee 4, Wis.

THE DEISTER CONCENTRATOR CO., 935 Glascow Ave., Fort Wayne 1, Ind.

●**DEISTER MACHINE CO.**, 1933 East Wayne St., Fort Wayne 4, Ind.

KNOX MFG. CO., 226 W. Clinton St., Oaklyn, N. J.

SPRAYING SYSTEMS CO., 3201 Randolph St., Bellwood, Ill.

●**YUBA MFG. CO.**, 351 California St., San Francisco 4, Calif.

O

OFFBEARERS, Power, Concrete Block

BERGEN MACHINE & TOOL CO., INC., 189 Franklin St., Nutley 10, N. J.

●**BESSER MFG. CO.**, Alpena, Mich.

COLUMBIA MACHINE WORKS, 107 S. Grand Ave., Vancouver, Wash.

F. C. GEORGE MACHINE CO., INC., 100 S. Westmoreland Dr., Orlando, Fla.

●**FLEMING MFG. CO.**, 4985 Fyler Ave., St. Louis, Mo.

HYDRO-FORGED STONE ASSOCIATES, INC., 420 Bulkley Bldg., Cleveland 15, Ohio

●**THE KENT MACHINE CO.**, 1931 Thomas St., Cuyahoga Falls, Ohio

●**LITH-I-BAR CO.**, Sentinal Bldg., Holland, Mich.

●**MULTIPLEX MACHINERY CORP.**, Elmore, Ohio

THE GENE OLSEN CORP., 401 Grace St., Adrian, Mich.

●**STEARNS MFG. CO., INC.**, 600 E. Beecher St., Adrian, Mich.

WITTEMANN MACHINERY CO., Paynters Road, Farmingdale, N. J.

OIL BURNERS

●**ALLIS-CHALMERS MFG. CO.**, 975 So. 70th St., Milwaukee 1, Wis.

●**THE BABCOCK & WILCOX CO.**, 85 Liberty St., New York 6, N. Y.

CLEAVER-BROOKS CO., 326 E. Keefe Ave., Milwaukee 12, Wis.

COEN COMPANY, 40 Boardman St., San Francisco 3, Calif.

COMBUSTION EQUIPMENT DIV., TODD SHIPYARDS CORP., 81-16 45th Ave., Elmhurst, Queens, N. Y.

COPPUS ENGINEERING CORP., 344 Park Ave., Worcester 2, Mass.

THE DENVER FIRE CLAY CO., 2301 Blake St., Denver 17, Colo.

●**DIAMOND IRON WORK, INC.**, 1728 North 2nd St., Minneapolis 11, Minn.

●**GENERAL ELECTRIC CO.**, 1 River Road, Schenectady 5, N. Y.

●**HAUCK MFG. CO.**, 124-136 Tenth St., Brooklyn 15, N. Y.

JOHNSTON MFG. CO., 2825 E. Hennepin Ave., Minneapolis 13, Minn.

THE MACLEOD CO., 2232-40 Bogen St., Cincinnati 22, Ohio

NATIONAL AIROIL BURNER CO., 1298 E. Sedgley Ave., Philadelphia 34, Pa.

RAY OIL BURNER CO., 401 Bernal Ave., San Francisco 12, Calif.

SIMPLICITY SYSTEM CO., Riverside Dr., Chattanooga 6, Tenn.

●**F. L. SMIDTH & CO.**, 11 W. 42nd St., New York 18, N. Y.

STAPLES & PFEIFFER, 528 Bryant St., San Francisco 7, Calif.

OIL FILTERS

FRAM CORPORATION, Providence 16, R. I.

GREENVILLE MFG. WORKS, 1121½ W. Fourth St., Greenville, Ohio

HONAN-CRANE CORP., 600 Wabash Ave., Lebanon, Ind.

LINCOLN ENGINEERING CO., 5701 Natural Bridge, St. Louis 20, Mo.

MULTI-METAL WIRE CLOTH CO., INC., 1358 Garrison Ave., New York 18, N. Y.

STAPLES & PFEIFFER, 528 Bryant St., San Francisco 7, Calif.

UNITED STATES HOFFMAN MACHINERY CORP., 105 Fourth Avenue, New York 3, N. Y.

W. G. B. OIL CLARIFIER, INC., 139 Cornell St., Kingston, N. Y.

WINSLOW ENGINEERING CO., 4069-73 Hollis St., Oakland 8, Calif.

OIL, Lubricants (see Lubricants)

P

PALLETS, Concrete Products

1. Steel
2. Wood
3. Other

ALLIED WELDING & MFG. CO., INC., 49 Loma Doone Blvd., Orlando, Fla.

ANCHOR CONCRETE MACHINERY CO., 1191 Fairview Ave., Columbus 12, Ohio
1—2—3

BERGEN MACHINE & TOOL CO., INC., 189 Franklin Ave., Nutley 10, N. J.
1

●**BESSER MFG. CO.**, Alpena, Mich.
1—2

BUILDERS STRUCTURAL STEEL CORP., 2880-2912 E. 34th St., Cleveland 15, Ohio

CHASE CONCRETE MACHINERY CO., 94 Grandview Ave., Buffalo 2, N. Y.
1—2—3

CHASE FDRY. & MFG. CO., 2300 Parsons Ave., Columbus 7, Ohio
1—2

●**COLUMBIA MACHINE WORKS**, 107 S. Grand Ave., Vancouver, Wash.

●**THE COMMERCIAL SHEARING & STAMPING CO.**, P. O. Box 719, Youngstown 1, Ohio
1

●**CONCRETE MACHINERY CO.**, P.O. Box 2248, Hickory, N. C.
3

ROY DARDEN INDUSTRIES, INC., P.O. Box 95, North Side Branch, Atlanta 3, Ga.
2—3

THE DOW CHEMICAL CO., Midland, Mich.
3

FABRICATORS STEEL & MFG. CORP., 850 E. 133rd St., Bronx 54, N. Y.
1

FRANTZ PATTERN & FOUNDRY CO., 2201 E. Artesia St., Long Beach 5, Calif.
3

FREDERICK IRON & STEEL CO., Frederick, Md.

●**THE FROG, SWITCH & MFG. CO.**, Carlisle, Pa.
1

GENERAL ENGINES CO., 307 Hunter St., Gloucester, N. J.
1

F. C. GEORGE MACHINE CO., INC., 100 S. Westmoreland Dr., Orlando, Fla.
3

HYDRO-FORGED STONE ASSOCIATES, INC., 420 Bulkley Bldg., Cleveland 15, Ohio
3

●**THE KENT MACHINE CO.**, 113 E. Portage Trail, Cuyahoga Falls, Ohio
1

LEWIS - SHEPARD PRODUCTS INC., 206 Walnut St., Watertown 72, Mass.
2

LIFETIME BUILDING SPECIALTIES INC., 519 Brook Haven Dr., Orlando, Fla.
1—3

●**LITH-I-BAR CO.**, Sentinal Building, Holland, Mich.
1

MISHCO CORP., 615 SW 2nd Ave., Miami, Fla.
1—3

●**MULTIPLEX MACHINERY CORP.**, Elmore, Ohio
1—2—3

THE GENE OLSEN CORP., 401 Grace Street, Adrian, Mich.

●**QUINN WIRE & IRON WORKS**, Boone, Iowa
3

SHERMAN CONCRETE PIPE MACHINERY, INC., P.O. Box 3278, Knoxville 17, Tenn.

SPEEDBLOCK, INC., 1144 Union Commerce Bldg., Cleveland 14, Ohio
3

●**STEARNS MFG. CO., INC.**, 600 E. Beecher St., Adrian, Mich.
1

TRUCKSON STEEL CO., Albert St., Youngstown 1, Ohio
1

R. K. TYRA CORP., Tyro, Minn.

UNIVERSAL CONCRETE MCHY. CO., INC., 297 S. High St., Columbus 15, Ohio
1

WITTEMANN MACHINERY CO., Paynters Road, Farmingdale, N. J.
1

● A dot before name indicates advertiser in this issue. See advertiser index.

DIRECTORY

PALLET CLEANERS

BERGEN MACHINE & TOOL CO., 189 Franklin Ave., Nutley 10, N. J.

•**BESSER MFG. CO.,** 205 47th St., Alpena, Mich.

•**COLUMBIA MACHINE WORKS,** 107 S. Grand Ave., Vancouver, Wash.

•**MULTIPLEX MACHINERY CORP.,** Elmore, Ohio

SPRINGFIELD PALLET CLEANER & MFG. CO., 501 Southwood Drive., Springfield, Ohio

•**STEARNS MFG. CO.,** 600 E. Beecher St., Adrian, Mich.

PANEL BOARDS, Electric

•**ALLIS-CHALMERS MFG. CO.,** 975 S. 70th St., Milwaukee 1, Wis.

THE BUDA COMPANY, 154th & Commercial, Harvey, Ill.

•**GENERAL ELECTRIC CO.,** 1 River Road, Schenectady 5, N. Y.

GREENVILLE MFG. WORKS, 112½ W. Fourth St., Greenville, Ohio

THE HAYS CORP., E. 8th St., Michigan City, Ind.

LITTLEFORD BROS., INC., 453 E. Pearl St., Cincinnati 2, Ohio

MISHCO CORP., 615 SW 2nd Ave., Miami, Fla.

•**STEARNS MFG. CO.,** 600 E. Beecher St., Adrian, Mich.

WESTINGHOUSE ELECTRIC CO., First Nat'l Bank Bldg., Pittsburgh, Pa.

PANS, GRINDING, Wet and Dry

•**EAGLE IRON WORKS,** 137 Holcomb Ave., Des Moines 4, Iowa

•**KENNEDY VAN SAUN MFG. & ENG. CORP.,** 2 Park Ave., New York 16, N. Y.

THE PATTERSON FOUNDRY & MACHINE CO., 1250 St. George St., East Liverpool, Ohio

•**W. A. RIDDELL CORP.,** Bucyrus, Ohio

UNITED IRON WORKS CO., 108 No. Locust, Pittsburg, Kans.

PANS, APRON, CONVEYOR (see Conveyors, Apron)

PERFORATED METAL (see Screen Plate)

PERLITE EXPANDING EQUIPMENT

PHOTO-ELECTRIC CELLS

THE CONVEYOR CO., 3260 East Slauson Ave., Los Angeles 11, Calif.

•**GENERAL ELECTRIC CO.,** 1 River Road, Schenectady 5, N. Y.

PHOTOSWITCH, INC., 77 Broadway, Cambridge 42, Mass.

WESTINGHOUSE ELECTRIC CO., First Nat'l Bank Bldg., Pittsburgh, Pa.

PILLOW BLOCKS (see Blocks, Pillow)

PIPE, Asbestos

JOHNS-MANVILLE, 22 E. 40th St., New York 16, N. Y.

QUIGLEY COMPANY, INC., 527 Fifth Ave., New York 17, N. Y.

PIPE, Dredge, Standard

AMERICAN STEEL DREDGE CO., INC., 2511 Taylor St., Fort Wayne 6, Ind.

BETHLEHEM STEEL CO., 701 E. Third St., Bethlehem, Pa.

ELLICOTT MACHINE CORP., 1611 Bush St., Baltimore 30, Md.

THE FLORI PIPE CO., 601-29 E. Red Bud Ave., St. Louis 15, Mo.

•**THE FROG, SWITCH & MFG. CO.,** Carlisle, Pa.

GREENVILLE MFG. WORKS, 112½ W. Fourth St., Greenville, Ohio

JOHNS-MANVILLE, 22 E. 40th St., New York 16, N. Y.

MECKUM ENGINEERING, INC., Dayton Rd., Ottawa, Ill.

NAYLOR PIPE CO., 1237 East 92nd St., Chicago 19, Ill.

REPUBLIC STEEL CORP., Republic Bldg., Cleveland 1, Ohio

TAYLOR FORGE & PIPE WORKS, P. O. Box 485, Chicago 90, Ill.

PIPE FITTINGS

BARCO MFG. CO., 1801 W. Winnemac Ave., Chicago 40, Ill.

BETHLEHEM STEEL CO., 701 E. Third St., Bethlehem, Pa.

THE CRANE CO., 836 S. Michigan Ave., Chicago 5, Ill.

ELECTRIC STEEL FOUNDRY CO., 2141 N. W. 25th Ave., Portland 10, Ore.

ERIE PUMP & ENGINE WORKS, 163 Glenwood Ave., Medina, N. Y.

THE FLORI PIPE CO., 601-29 E. Red Bud Ave., St. Louis 15, Mo.

GEORGIA IRON WORKS CO., 605 12th St., Augusta, Ga.

GREENVILLE MFG. WORKS, 112½ W. Fourth St., Greenville, Ohio

HAYNES STELLITE COMPANY, DIV. OF UNION CARBIDE & CARBON CORP., South Lindsay St., Kokomo, Ind.

MECKUM ENGINEERING, INC., Dayton Rd., Ottawa, Ill.

NAYLOR PIPE CO., 1237 East 92nd St., Chicago 19, Ill.

TAYLOR FORGE & PIPE WORKS, P.O. Box 485, Chicago 90, Ill.

VICTAULIC CO. OF AMERICA, 30 Rockefeller Plaza, New York 20, N. Y.

WALWORTH CO., 60 East 42nd St., New York 17, N. Y.

R. D. WOOD CO., 1072 Public Ledger Bldg., Philadelphia 5, Pa.

PIPE, Rubber Lined

THE EIMCO CORP., P.O. Box 300, Salt Lake City 10, Utah

THE GATES RUBBER CO., 999 S. Broadway, Denver 17, Colo.

GOODALL RUBBER CO., Whitehead Road, Trenton 4, N. J.

•**THE GOODYEAR TIRE & RUBBER CO., INC.,** 1144 E. Market St., Akron 16, Ohio

•**HEWITT RUBBER DIV., HEWITT-ROBINS, INC.,** 240 Kensington Ave., Buffalo 5, N. Y.

NAYLOR PIPE CO., 1237 East 92nd St., Chicago 19, Ill.

RAYBESTOS - MANHATTAN, INC., 61 Willett St., Passaic, N. J.

UNITED STATES RUBBER CO., 1230 Ave. of the Americas, New York 20, N. Y.

PIPE, Spiral

ARMCO DRAINAGE & METAL PRODUCTS, INC., 1939 Armco Ave., Middletown, Ohio

NAYLOR PIPE CO., 1237 E. 92nd St., Chicago 19, Ill.

TAYLOR FORGE & PIPE WORKS, P.O. Box 485, Chicago 90, Ill.

PLANERS, Shale

•**EAGLE IRON WORKS,** 137 Holcomb Ave., Des Moines 4, Iowa

PLASTER MACHINERY

MILLER-KOMLINE CORP., Peapack, N. J.

PLASTER MIXERS (see Mixers, Plaster)

PNEUMATIC CONVEYORS (see Conveyors, Air)

POLISHING MACHINES, Concrete

STOW MANUFACTURING CO., 49 Shear St., Binghamton, N. Y.

PONTOONS, Dredge and Pipe

AMERICAN STEEL DREDGE CO., INC., 2511 Taylor St., Fort Wayne 6, Ind.

BODINSON MFG CO., 2401 Bayshore Blvd., San Francisco 24, Calif.

•**EAGLE IRON WORKS,** 137 Holcomb Ave., Des Moines 4, Iowa

ELLICOTT MACHINE CORP., 1611 Bush St., Baltimore 30, Md.

GEORGIA IRON WORKS CO., 605-12th St., Augusta, Ga.

GREENVILLE MFG. WORKS, 112½ W. Fourth St., Greenville, Ohio

HETHERINGTON & BERNER INC., 701-745 Kentucky Ave., Indianapolis 7, Ind.

INGALLS SHIPBUILDING CORP., P. O. Drawer 2638, Birmingham 2, Ala.

MANITOWOC ENGINEERING WORKS, Manitowoc, Wis.

MECKUM ENGINEERING, INC., Dayton Rd., Ottawa, Ill.

NAYLOR PIPE CO., 1237 East 92nd St., Chicago 19, Ill.

PORTABLE AGGREGATES PLANTS, Crushing & Screening Plants (see Crushing & Screening Plants, Mobile Mounted)

POWDER, Blasting (see Explosives & Dynamite)

POWER STATION EQUIPMENT

•**ALLIS-CHALMERS MFG. CO.,** 975 So. 70th St., Milwaukee 1, Wis.

•**BAILEY METER CO.,** 1050 Ivanhoe Road, Cleveland 10, Ohio

DE LAVAL STEAM TURBINE CO., Trenton 2, N. J.

•**GENERAL ELECTRIC CO.,** 1 River Road, Schenectady 5, N. Y.

THE HAYS CORP., East 8th St., Michigan City, Ind.

INTERNATIONAL DIESEL ELECTRIC CO., INC., 13-02 44th Ave., Long Island City 1, N. Y.

THE JEFFREY MFG. CO., 935 N. 4th St., Columbus 16, Ohio

•**PENNSYLVANIA CRUSHER CO.,** Liberty Trust Bldg., Philadelphia 7, Pa.

STEPHENS-ADAMSON MFG. CO., 7 Ridgeway Ave., Aurora, Ill.

WESTINGHOUSE ELECTRIC CO., First Nat'l Bank Bldg., Pittsburgh, Pa.

PRECIPITATORS, Dust, Electrical (see Dust Collectors, Electrical)

PREHEATERS, for Kilns, etc.

•**KENNEDY VAN SAUN MFG. & ENG. CORP.,** 2 Park Ave., New York 16, N. Y.

NATIONAL AIROIL BURNER CO., 1298 E. Sedgley Ave., Philadelphia 34, Pa.

THE PATTERSON FOUNDRY & MACHINE CO., 1250 St. George St., East Liverpool, Ohio

POSEY IRON WORKS, INC., INDUSTRIAL HEATING DIVN., 560 S. Prince St., Lancaster, Pa.

•**F. L. SMIDTH & CO.,** 11 W. 42nd St., New York 18, N. Y.

PROPORTIONING EQUIPMENT (see Batchers)

PROTECTIVE COATINGS

AMERICAN FLURESIT CO., INC., 4011 Red Bank Road, Cincinnati 27, Ohio

BLUE RIDGE TALC CO. INC., P.O. Box 7, Henry 6, Va.

COLORCRETE INDUSTRIES, INC., 510 Ottawa Ave., Holland, Mich.

•**GENERAL ELECTRIC CO.,** 1 River Road, Schenectady 5, N. Y.

GOODALL RUBBER CO., 403 Whitehead Road, Trenton 4, N. J.

A. C. HORN CO., INC., 10th St. & 44th Ave., Long Island City 1, N. Y.

E. F. HOUGHTON & CO., 303 W. Lehigh Ave., Philadelphia 33, Pa.

KOPPERS CO., INC., Koppers Bldg., Pittsburgh 19, Pa.

LUKENS STEEL CO., 521 Lukens Bldg., Coatesville, Pa.

THE MASTER BUILDERS CO., 7016 Euclid Ave., Cleveland 3, Ohio

MEXICO REFRACTORIES CO., Mex-R-Co. Building, Mexico, Mo.

GEO. R. MOWAT CO., 24-26 W. 40th St., New York 18, N. Y.

QUIGLEY COMPANY, INC., 527 Fifth Ave., New York 17, N. Y.

RUST-OLEUM CORP., 2425 Oakton St., Evanston, Ill.

SIKA CHEMICAL CORP., 35 Gregory Ave., Passaic, N. J.

L. SONNEBORN SONS, INC., 300 Fourth Ave., New York 10, N. Y.

SPRAY-O-BOND COMPANY, 2225 N. Humboldt Ave., Milwaukee 12, Wis.

WESTINGHOUSE ELECTRIC CO., First Nat'l Bank Bldg, Pittsburgh, Pa.

PULLERS, Car (see Car Movers)

PULLERS, Gear, Wheel & Bearing

ARMSTRONG-BRAY & CO., 5364 Northwest Highway, Chicago 30, Ill.

BLACKHAWK MFG. CO., 5325 W. Rogers St., Milwaukee, Wis.

RODGERS HYDRAULIC INC., 7401 Walker St., Minneapolis 16, Minn.

STEARNS - ROGERS MFG. CO., 1720 California St., Denver 2, Colo.

PULLEYS, Clutch

CONTINENTAL GIN CO., P. O. Box 2614, Birmingham, Ala.

DODGE MANUFACTURING CORP., Mishawaka, Ind.

THE JEFFREY MFG. CO., 935 N. 4th St., Columbus 16, Ohio

• A dot before name indicates advertiser in this issue. See advertiser index.

DIRECTORY

W. A. JONES FOUNDRY & MACHINE CO., 4401 Roosevelt Rd., Chicago 24, Ill.

●**LINK-BELT CO.,** 300 W. Pershing Road, Chicago 9, Ill.

MINNEAPOLIS - MOLINE CO., P. O. Box 1050, Minneapolis 1, Minn.

WEBSTER MFG. INC., Tiffin 16, Ohio

PULLEYS, Conveyor and Elevator

THE AMERICAN PULLEY CO., 4200 Wissahickon Ave., Philadelphia 29, Penna.

ANDERSON ENGINEERING CO., 237 Bent St., Cambridge 41, Mass.

THE C. O. BARTLETT AND SNOW CO., 6200 Harvard Ave., Cleveland 5, Ohio

●**BAUGHMAN MFG. CO.,** 1000 Shipman Road, Jerseyville, Ill.

BEAUMONT BIRCH CO., 1512 Race St., Philadelphia 2, Pa.

BODINSON MFG. CO., 2401 Bayshore Blvd., San Francisco 24, Calif.

●**CONTINENTAL GIN CO.,** 4500 5th Ave. S., Birmingham, Ala.

THE CONVEYOR CO., 3260 East Slauson Ave., Los Angeles 11, Calif.

R. & J. DICK CO., INC., P. O. Box 388, Passaic, N. J.

DODGE MANUFACTURING CORP., Mishawaka, Ind.

●**THE J. B. EHRSAM & SONS MFG. CO.,** Enterprise, Kans.

●**A. B. FARQUHAR CO.,** 142 N. Duke, Dept. 28, York, Pa.

THE GATES RUBBER CO., 999 S. Broadway, Denver 17, Colo.

GEORGE HAISS MFG. CO., INC., Park Ave. and 143rd St., New York 51, N. Y.

GREENVILLE MFG. WORKS, 1121½ W. Fourth St., Greenville, Ohio

HARDSOGG PNEUMATIC TOOL CO., 225 So. Benton St., Ottumwa, Iowa

THE HELTZEL STEEL FORM AND IRON CO., 1750 Thomas Road, Warren, Ohio

●**ROBINS CONVEYORS DIV., HEWITT-ROBINS INC.,** 270 Passaic Ave., Passaic, N. J.

●**IOWA MFG. CO.,** 916 16th St., N. E., Cedar Rapids, Iowa

THE JEFFREY MFG. CO., 935 N. 4th St., Columbus 16, Ohio

W. A. JONES FOUNDRY & MACHINE CO., 4401 Roosevelt Rd., Chicago 24, Ill.

FRANK A. KREMSER & SONS, INC., 3435-45 N. 5th St., Philadelphia 40, Pa.

●**LINK-BELT CO.,** 300 W. Pershing Road, Chicago 9, Ill.

●**LIPPMANN ENGINEERING WORKS,** 4603 W. Mitchell St., Milwaukee 14, Wis.

E. F. MARSH ENG. CO., 4324 W. Clayton Ave., St. Louis 10, Mo.

THE MEDART CO., 100 Potomac St., St. Louis 18, Mo.

●**McLANAHAN AND STONE CORP.,** Hollidaysburg, Pa.

●**PETTIBONE-MULLIKEN CORP., IMPACT MASTER DIVISION** 4700 W. Division St., Chicago 51, Ill.

PHILADELPHIA GEAR WORKS, Erie Ave. and G St., Philadelphia, Pa.

PYOTT FOUNDRY & MACHINE CO., 328 No. Sangamon St., Chicago 7, Ill.

ROGERS IRON WORKS CO., 11th & Pearl Sts., Joplin, Mo.

●**SMITH ENGINEERING WORKS,** 532 E. Capitol Dr., Milwaukee 12, Wis.

SPROUT, WALDRON & CO., INC., Muncy, Pa.

STEPHENS-ADAMSON MFG. CO., 7 Ridgeway Ave., Aurora, Ill.

TROWBRIDGE CONVEYOR CO., 851 Van Houten Ave., Clifton, N. J.

UNITED IRON WORKS CO., 108 No. Locust, Pittsburg, Kans.

WEBSTER MFG. INC., Tiffin 16, Ohio

●**YUBA MFG. CO.,** 351 California St., San Francisco 4, Cal.

PULLEYS, Magnetic (see Magnetic Separators)

PULP DENSITY CONTROLLERS

FARMERS ENG. & MFG. CO., 549 Brushton Ave., Pittsburgh 21, Pa.

THE MINE AND SMELTER SUPPLY CO., 1422 17th Street, Denver 17, Colo.

MINNEAPOLIS - HONEYWELL REGULATOR CO., BROWN INSTRUMENTS DIV., Wayne & Windrim Aves., Philadelphia 44, Pa.

PULVERIZER FUEL SYSTEMS (see Coal Pulverizing Equipment, Direct Firing)

PULVERIZERS (see Mills)

PUMPS, Air Lift

1. Cement
2. Slurry
3. Water

AMERICAN BRAKE SHOE CO., 230 Park Ave., New York 17, N. Y.
2

●**AMERICAN MANGANESE STEEL DIV. OF AMERICAN BRAKE SHOE CO.,** 377 E. 14th St., Chicago Heights, Ill.
2

B. F. M. INDUSTRIES, INC., 2124 Mill Ave., Brooklyn 34, N. Y.
3

C. H. & E. MFG. CO., 3849 N. Palmer St., Milwaukee 12, Wis.
3

●**CHAIN BELT CO.,** 1600 W. Bruce St., Milwaukee 4, Wis.
3

●**CHICAGO PNEUMATIC TOOL CO.,** 6 E. 44th St., New York 17, N. Y.
3

CONSTRUCTION MACHINERY CO'S., Glenwood & Vinton Sts., Waterloo, Iowa
3

DE LAVAL STEAM TURBINE CO., Trenton 2, N. J.
3

●**FULLER COMPANY,** Fuller Bldg., Catasauqua, Pa.
1

●**GARDNER-DENVER CO.,** Quincy, Ill.
1—2—3

INGERSOLL-RAND CO., 11 Broadway, New York 4, N. Y.
2—3

LAWRENCE MACHINE & PUMP CORP., 371 Market St., Lawrence, Mass.
2—3

PENNSYLVANIA PUMP & COMPRESSOR CO., Bushkill Drive, Easton, Pa.
1—2—3

ROBINSON AIR - ACTIVATED CONVEYOR SYSTEMS, 205 E. 42nd St., New York 17, N. Y.
1

●**F. L. SMIDTH & CO.,** 11 W. 42nd St., New York 18, N. Y.
1—2—3

PUMPS, Asphalt

HETHERINGTON & BERNER INC., 701-745 Kentucky Ave., Indianapolis 7, Ind.

LINCOLN ENGINEERING CO., 5701 Natural Bridge, St. Louis 20, Mo.

MADSEN IRON WORKS, INC., 5631 Bickett St., Huntington Park, Calif.

H. K. PORTER CO., INC., 49th & Harrison Sts., Pittsburgh 1, Pa.

WORTHINGTON PUMP & MACHINERY CORP., Worthington Ave., Harrison, N. J.

PUMPS, Cement

THE BRADY CONVEYORS CORP., 20 W. Jackson Blvd., Chicago 4, Ill.

●**GARDNER-DENVER CO.,** Quincy, Ill.

●**KENNEDY VAN SAUN MFG. & ENG. CORP.,** 2 Park Ave., New York 16, N. Y.

LINCOLN ENGINEERING CO., 5701 Natural Bridge, St. Louis 20, Mo.

MORRIS MACHINE WORKS, Baldwinsville, N. Y.

ROBINSON AIR - ACTIVATED CONVEYOR SYSTEMS, 205 E. 42nd St., New York 17, N. Y.

●**F. L. SMIDTH & CO.,** 11 W. 42nd St., New York 18, N. Y.

PUMPS, Concrete

●**CHAIN BELT CO.,** 1600 W. Bruce St., Milwaukee 4, Wis.

●**GARDNER-DENVER CO.,** Quincy, Ill.

LINCOLN ENGINEERING CO., 5701 Natural Bridge, St. Louis 20, Mo.

WORTHINGTON PUMP & MACHINERY CORP., Worthington Ave., Harrison, N. J.

PUMPS, Dredge

●**ALLEN-SHERMAN-HOFF PUMP CO.,** 259 E. Lancaster Ave., Wynnewood, Pa.

●**ALLIS - CHALMERS MFG. CO.,** 975 S. 70th St., Milwaukee 1, Wis.

AMERICAN BRAKE SHOE CO., 230 Park Ave., New York 17, N. Y.

●**AMERICAN MANGANESE STEEL DIV., OF AMERICAN BRAKE SHOE CO.,** 377 E. 14th St., Chicago Heights, Ill.

AMERICAN STEEL DREDGE CO., INC., 2511 Taylor St., Fort Wayne 6, Ind.

B. F. M. INDUSTRIES, INC., 2124 Mill Ave., Brooklyn 34, N. Y.

CARVER PUMP CO., 1056 Hershey Ave., Muscatine, Iowa

ELECTRIC STEEL FOUNDRY CO., 2141 N. W. 25th Ave., Portland 10, Ore.

ELLICOTT MACHINE CORP., 1611 Bush St., Baltimore 30, Md.

ERIE PUMP AND ENGINE WORKS, 163 Glenwood Ave., Medina, N. Y.

FAIRBANKS MORSE & CO., 600 S. Michigan Ave., Chicago 5, Ill.

●**THE FROG, SWITCH & MFG. CO.,** Carlisle, Pa.

●**GARDNER DENVER CO.,** Quincy, Ill.

GEORGIA IRON WORKS CO., 605 12th St., Augusta, Ga.

GREENVILLE MFG. WORKS, 1121½ W. Fourth St., Greenville, Ohio

HETHERINGTON & BERNER INC., 701-745 Kentucky Ave., Indianapolis 7, Ind.

BYRON JACKSON CO., 2301 E. Vernon Ave., Los Angeles 11, Calif.

KANSAS CITY HAY PRESS CO., 801 Woodswether Road, Kansas City 6, Mo.

LAWRENCE MACHINE & PUMP CORP., 371 Market St., Lawrence, Mass.

MECKUM ENGINEERING, INC., Dayton Rd., Ottawa, Ill.

MILLVILLE IRON WORKS INC., 6th St. & Florence Ave., Millville, N. J.

MORRIS MACHINE WORKS, Baldwinsville, N. Y.

●**PETTIBONE-MULLIKEN CORP.,** 4710 W. Division St., Chicago 51, Ill.

●**TAYLOR-WHARTON IRON & STEEL CO.,** High Bridge, N. J.

●**THOMAS FOUNDRIES, INC.,** P.O. Box 1111, Birmingham 1, Ala.

WORTHINGTON PUMP & MACHINERY CORP., Worthington Ave., Harrison, N. J.

●**YUBA MFG. CO.,** 351 California St., San Francisco 4, Calif.

PUMPS, Sand

ALLEN CONE & MACHINERY CORP., 120 Broadway, New York 5, N. Y.

●**ALLEN-SHERMAN-HOFF PUMP CO.,** 259 E. Lancaster Ave., Wynnewood, Pa.

●**ALLIS - CHALMERS MFG. CO.,** 975 So. 70th St., Milwaukee 1, Wis.

AMERICAN BRAKE SHOE CO., 230 Park Ave., New York 17, N. Y.

●**AMERICAN MANGANESE STEEL DIV. OF AMERICAN BRAKE SHOE CO.,** 401 E. 14th St., Chicago Heights, Ill.

●**DENVER EQUIPMENT CO.,** 1410 Seventeenth St., Denver 17, Colo.

THE BRADY CONVEYORS CORP., 20 W. Jackson Blvd., Chicago 4, Ill.

THE DORR CO., INC., Barry Place, Stamford, Conn.

ELLICOTT MACHINE CORP., 1611 Bush St., Baltimore 30, Md.

ERIE PUMP AND ENGINE WORKS, 163 Glenwood Ave., Medina, N. Y.

GEORGIA IRON WORKS CO., 605 12th St., Augusta, Ga.

GREENVILLE MFG. WORKS, 1121½ W. Fourth St., Greenville, Ohio

HETHERINGTON & BERNER INC., 701-745 Kentucky Ave., Indianapolis 7, Ind.

BYRON JACKSON CO., 2300 E. Vernon Ave., Los Angeles 11, Calif.

KANSAS CITY HAY PRESS CO., 801 Woodswether Road, Kansas City 6, Mo.

LAWRENCE MACHINE & PUMP CORP., 371 Market St., Lawrence, Mass.

LINCOLN ENGINEERING CO., 5701 Natural Bridge, St. Louis 20, Mo.

MECKUM ENGINEERING, INC., Dayton Rd., Ottawa, Ill.

MILLVILLE IRON WORKS INC., 6th St. & Florence Ave., Millville, N. J.

THE MINE & SMELTER SUPPLY CO., 1422 17th St., Denver 17, Colo.

MORRIS MACHINE WORKS, Baldwinsville, N. Y.

PEKOR IRON WORKS, Ft. of E. 9th St., Columbus, Ga.

●**PETTIBONE MULLIKEN CORP.,** 4710 W. Division St., Chicago 51, Ill.

●**TAYLOR-WHARTON IRON & STEEL CO.,** High Bridge, N. J.

● A dot before name indicates advertiser in this issue. See advertiser index.

DIRECTORY

●**THOMAS FOUNDRIES, INC.**, P.O. Box 1111, Birmingham 1, Ala.

●**WESTERN MACHINERY CO.**, 760-766 Folsom St., San Francisco 7, Calif.

●**A. R. WILFLEY & SONS, INC.**, P. O. Box 2330, Denver 1, Colo.

●**YUBA MFG. CO.**, 351 California St., San Francisco 4, Calif.

PUMPS, Slurry

ALLEN CONE & MACHINERY CORP., 120 Broadway, New York 5, N. Y.

●**ALLEN-SHERMAN-HOFF PUMP CO.**, 259 E. Lancaster Ave., Wynnewood, Pa.

●**ALLIS-CHALMERS MFG. CO.**, 975 So. 70th St., Milwaukee 1, Wis.

AMERICAN BRAKE SHOE CO., 230 Park Ave., New York 17, N. Y.

●**AMERICAN MANGANESE STEEL DIV. OF AMERICAN BRAKE SHOE CO.**, 401 E. 14th St., Chicago Heights, Ill.

●**THE DORR CO., INC.**, Barry Place, Stamford, Conn.

ERIE PUMP AND ENGINE WORKS, 163 Glenwood Ave., Medina, N. Y.

FREDERICK IRON & STEEL CO., Frederick, Md.

GALENA MACHINE & ELECTRIC CO., 209-11 Main St., Galena, Kans.

●**GARDNER-DENVER CO.**, Quincy, Ill.

GEORGIA IRON WORKS CO., 605 12th St., Augusta, Ga.

GOULDS PUMPS, INC., 300 Fall St., Seneca Falls, N. Y.

INGERSOLL-RAND CO., 11 Broadway, New York 4, N. Y.

BYRON JACKSON CO., 2301 E. Vernon Ave., Los Angeles 11, Calif.

LAWRENCE MACHINE & PUMP CORP., 371 Market St., Lawrence, Mass.

MILLVILLE IRON WORKS INC., 6th St. & Florence Ave., Millville, N. J.

THE MINE & SMELTER SUPPLY CO., 1422 17th St., Denver 17, Colo.

MORRIS MACHINE WORKS, Baldwinsville, N. Y.

OLIVER UNITED FILTERS INC., 33 W. 42nd St., New York 18, N. Y.

●**PETTIBONE MULLIKEN CORP.**, 4710 W. Division St., Chicago 51, Ill.

H. K. PORTER CO., INC., 49th & Harrison Sts., Pittsburgh 1, Pa.

●**F. L. SMIDTH & CO.**, 11 W. 42nd St., New York 18, N. Y.

SPECK SALES AND MFG. CO., 206 Main St., Galena, Kans.

●**WESTERN MACHINERY CO.**, 760-766 Folsom St., San Francisco 7, Calif.

●**A. R. WILFLEY & SONS, INC.**, P. O. Box 2330, Denver 1, Colo.

WORTHINGTON PUMP & MACHINERY CORP., Worthington Ave., Harrison, N. J.

●**YUBA MFG. CO.**, 351 California St., San Francisco 4, Calif.

PUMPS

1. **Centrifugal**
2. **Deep Well**
3. **Diaphragm**
4. **Rubber-Lined**
5. **Vacuum**
6. **Hydraulic**

●**ALLEN-SHERMAN-HOFF PUMP CO.**, 259 E. Lancaster Ave., Wynnewood, Pa.
4

ALLEN CONE & MACHINERY CORP., 120 Broadway, New York 5, N. Y.
4

●**ALLIS-CHALMERS MFG. CO.**, 975 So. 70th St., Milwaukee 1, Wis.
1—4—5

AMERICAN BRAKE SHOE CO., 230 Park Ave., New York 17, N. Y.

●**AMERICAN MANGANESE STEEL DIV. OF AMERICAN BRAKE SHOE CO.**, 377 E. 14th St., Chicago Heights, Ill.
1

ANTHONY COMPANY, Streator, Ill.
6

B. F. M. INDUSTRIES, INC., 2124 Mill Ave., Brooklyn 34, N. Y.
1

BERKELEY PUMP CO., 829 Bancroft Way, Berkeley 2, Calif.
1—2

BETHLEHEM STEEL CO., 701 E. Third St., Bethlehem, Pa.
6

BIRDSBORO STEEL FOUNDRY & MACHINE CO., Birdsboro, Pa.
1

BLACKHAWK MFG. CO., 5235 W. Rogers St., Milwaukee, Wis.
6

BUFFALO FORGE CO., 490 Broadway, Buffalo 5, N. Y.
1—4

C. H. & E. MFG. CO., 3849 N. Palmer St., Milwaukee 12, Wis.
1—3

CARVER PUMP CO., 1056 Hershey Ave., Muscatine, Iowa
1—3

CENTRAL SCIENTIFIC CO., 1700 Irving Park Rd., Chicago 13, Ill.
5

●**CHAIN BELT CO.**, 1600 W. Bruce St., Milwaukee 4, Wis.
1—3

●**CHICAGO PNEUMATIC TOOL CO.**, 6 E. 44th St., New York 17, N. Y.
5

CLAYTON MFG. CO., 401 N. Temple City Blvd., P.O. Box 550, El Monte, Calif.
3

CONSTRUCTION MACHINERY CO'S., Glenwood & Vinton Sts., Waterloo, Iowa
1—3

COOPER-BESSEMER CORP., Mount Vernon, Ohio
2

DAYBROOK HYDRAULIC CORP., 500 Lehman Avenue, Bowling Green, Ohio

DEAN BROTHERS PUMPS INC., 323 W. 10th St., Indianapolis 7, Ind.
1

DE LAVAL STEAM TURBINE CO., Trenton 2, N. J.
1—4—6

●**DENVER EQUIPMENT CO.**, 1410 Seventeenth St., Denver 17, Colo.
1—3—4

●**THE DORR CO., INC.**, Barry Place, Stamford, Conn.
3

ELLICOTT MACHINE CORP., 1611 Bush St., Baltimore 30, Md.
1

ERIE PUMP AND ENGINE WORKS, 163 Glenwood Ave., Medina, N. Y.
1

FAIRBANKS MORSE & CO., 600 S. Michigan Ave., Chicago 5, Ill.
1—2

●**FULLER COMPANY**, Fuller Bldg., Catasauqua, Pa.
5

GALENA MACHINE & ELECTRIC CO., 209-11 Main St., Galena, Kans.
1—3

●**GARDNER-DENVER CO.**, Quincy, Ill.
1—5

GAR WOOD INDUSTRIES, INC., WAYNE DIV., Wayne, Mich.
6

GENERAL SCIENTIFIC EQUIPMENT CO., 27th and Huntingdon Sts., Philadelphia 32, Pa.
3

GEORGIA IRON WORKS CO., 605 12th St., Augusta, Ga.
4

GOODALL RUBBER CO., Whitehead Road, Trenton 4, N. J.
4

THE GORMAN-RUPP CO., 305 Bowman St., Mansfield, Ohio
1

GOULDS PUMPS, INC., 300 Fall St., Seneca Falls, N. Y.
1

GREENVILLE MFG. WORKS, 112½ W. Fourth St., Greenville, Ohio

HARDINGE CO., INC., 240 Arch St., York, Pa.
3

HOMELITE CORP., Riverdale Ave., Port Chester, N. Y.
1

INGERSOLL-RAND CO., 11 Broadway, New York 4, N. Y.
1—2—5

BYRON JACKSON CO., 2301 E. Vernon Ave., Los Angeles 11, Calif.
1—2

●**THE JAEGER MACHINE CO.**, 550 W. Spring St., Columbus 16, Ohio
1—3

KANSAS CITY HAY PRESS CO., 801 Woodswether Road, Kansas City 6, Mo.
1

KEYSTONE DRILLER CO., 8th Ave., Beaver Falls, Pa.
2

LAPLANT-CHOATE MFG. CO., INC., 2920 1st Ave. N. E., Cedar Rapids, Iowa
6

LAWRENCE MACHINE & PUMP CORP., 371 Market St., Lawrence, Mass.
1

LINCOLN ENGINEERING CO., 5701 Natural Bridge, St. Louis 20, Mo.
6

MECKUM ENGINEERING, INC., Dayton Rd., Ottawa, Ill.
1

THE MINE & SMELTER SUPPLY CO., 1422 17th St., Denver 17, Colo.
1—4

MORRIS MACHINE WORKS, Baldwinsville, N. Y.
1—4

MORSE BROS. MACHINERY CO., 2900 Brighton Blvd., Denver 1, Colo.
1—2

●**NAGLE PUMP INC.**, 1245 Center, Chicago Heights, Ill.

OLIVER UNITED FILTERS INC., 33 W. 42nd St., New York 18, N. Y.
1—3—5

PEERLESS PUMP DIV., FOOD MACH'Y & CHEM. CORP., 301 West Ave. 26, Los Angeles 31, Calif.
1—2

PEKOR IRON WORKS, Lock Drawer 909, Columbus, Ga.
1

PENNSYLVANIA PUMP & COMPRESSOR CO., Bushkill Drive, Easton, Pa.
1—5—6

H. K. PORTER CO., INC., 49th & Harrison Sts., Pittsburgh 1, Pa.
1—4

QUINCY COMPRESSOR CO., 217 Maine St., Quincy, Ill.
5

RAYBESTOS-MANHATTAN, INC., 61 Willett St., Passaic, N. J.
1—2—3—4

RODGERS HYDRAULIC INC., 7401 Walker St., Minneapolis 16, Minn.
6

ST. PAUL HYDRAULIC HOIST, 2207 University Ave., S. E. Minneapolis 14, Minn.

SPECK SALES & MFG. CO., 206 Main St., Galena, Kans.
3

THE RUCKER CO., 4228 Hollis St., Oakland 8, Calif.
6

●**TAYLOR-WHARTON IRON & STEEL CO.**, High Bridge, N. J.
1

UNITED IRON WORKS CO., 108 No. Locust, Pittsburg, Kans.
1—2

VERNON TOOL CO., LTD., 1101 Meridian Ave., Alhambra, Calif.
1

VICKERS INC., DIV. SPERRY CORP., 1400 Oakman Blvd., Detroit 32, Mich.
6

●**WESTERN MACHINERY CO.**, 760-766 Folsom St., San Francisco 7, Calif.
1—3—4

THE WEINMAN PUMP MFG. CO., 290 Spruce St., Columbus, 8, Ohio

●**A. R. WILFLEY & SONS, INC.**, P. O. Box 2330, Denver 1, Colo.
1—4

WORTHINGTON PUMP & MACHINERY CORP., Worthington Ave., Harrison, N. J.
1—2—5

PYROMETERS

●**BAILEY METER CO.**, 1050 Ivanhoe Road, Cleveland 10, Ohio

THE BRISTOL CO., Waterbury 20, Conn.

CAMBRIDGE INSTRUMENT CO. INC., 3765 Grand Central Terminal, New York 17, N. Y.

THE DENVER FIRE CLAY CO., 2301 Blake St., Denver 17, Colo.

THE FOXBORO CO., Neponset Ave., Foxboro, Mass.

●**GENERAL ELECTRIC CO.**, 1 River Road, Schenectady 5, N. Y.

LEEDS & NORTHRUP CO., 4970 Stenton Ave., Philadelphia 44, Pa.

MANNING, MAXWELL & MOORE, INC., 250 East Main St., Stratford, Conn.

MINNEAPOLIS-HONEYWELL REGULATOR CO., BROWN INSTRUMENTS DIV., Wayne & Windrim Aves., Philadelphia 44, Pa.

●**F. L. SMIDTH & CO.**, 11 W. 42nd St., New York 18, N. Y.

WESTINGHOUSE ELECTRIC CO., First Nat'l Bank Bldg., Pittsburgh, Pa.

WHEELCO INSTRUMENTS CO., 847 W. Harrison St., Chicago 7, Ill.

R

RACKS, Curing, Concrete Masonry

ALLIED WELDING & MFG. CO., INC., 49 Lorna Doone Blvd., Orlando, Fla.

ANCHOR CONCRETE MACHINERY CO., 1191 Fairview Ave., Columbus 12, Ohio

●**BESSER MFG. CO.**, Alpena, Mich.

CAMPION FUEL ENG. DIV., P. O. Box 3941P, Detroit 27, Mich.

CHASE CONCRETE MACHINERY CO., 15 Linwood Ave., Buffalo 2, N. Y.

THE CHASE FOUNDRY & MFG. CO., 2300 S. Parsons Ave., Columbus 7, Ohio

COLUMBIA MACHINE WORKS, 107 S. Grand Ave., Vancouver Wash.

● A dot before name indicates advertiser in this issue. See advertiser index.

DIRECTORY

●**FLEMING MFG. CO.,** 4985 Fyler Ave., St. Louis 9, Mo.

GENERAL ENGINES CO INC., 307 Hunter St., Gloucester, N. J.

F. C. GEORGE MACHINE CO., INC., 100 S. Westmoreland Dr., Orlando, Fla.

●**LITH-I-BAR CO.,** Sentinal Building, Holland, Mich.

●**MULTIPLEX MACHINERY CORP.,** Elmore, Ohio

THE GENE OLSEN CORP., 401 Grace St., Adrian, Mich.

●**STEARNS MFG. CO.,** 600 E. Beecher St., Adrian, Mich.

WITTEMANN MACHINERY CO., Paynters Road, Farmingdale, N. J.

RAILS, Relay

BIRMINGHAM RAIL & LOCOMOTIVE CO., P.O. Box 391, Birmingham 1, Ala.

L. B. FOSTER CO., P. O. Box 1647, Pittsburgh 30, Pa.

MIDWEST STEEL CORP., P.O. Box 271, Charleston 2, W. Va.

RAILWAY, Industrial Equipment

ATLAS CORPORATION, Mountville, Pa.

BETHLEHEM STEEL CO., E. Third St., Bethlehem, Pa.

BIRMINGHAM RAIL & LOCOMOTIVE CO., P.O. Box 391, Birmingham 1, Ala.

EASTON CAR & CONSTRUCTION CO., Easton, Pa.

L. B. FOSTER CO., P. O. Box 1647, Pittsburgh 30, Pa.

●**GENERAL ELECTRIC CO.,** 1 River Road, Schenectady 5, N. Y.

MIDWEST STEEL CORP., Charleston 2, W. Va.

PRESSED STEEL CAR CO., INC., 25 Broad St., New York 4, N. Y

RAILWAYS, Electric

●**GENERAL ELECTRIC CO.,** 1 River Road, Schenectady 5, N. Y.

WESTINGHOUSE ELECTRIC CO., First Nat'l Bank Bldg., Pittsburgh, Pa.

READY-MIXED CONCRETE PLANTS (see Batching Plants)

READY MIXED TRUCKS (see Bodies, Ready Mixed Concrete)

RECORDERS, Concrete Batching

HARDY SCALES CO., 5701 So Atlantic Blvd., Maywood, Calif.

THE HELTZEL STEEL FORM & IRON CO., 1750 Thomas Rd., Warren, Ohio

NOBLE CO., 1860 Seventh St., Oakland 20, Calif.

RECORDERS

1. **Draft**
2. **Pressure**
3. **Temperature**

●**BAILEY METER CO.,** 1050 Ivanhoe Road, Cleveland 10, Ohio
1—2—3

THE BRISTOL CO., Waterbury 20, Conn.
1—2—3

THE FOXBORO CO., Neponset Ave., Foxboro, Mass.
2—3

THE HAYS CORP., East 8th St., Michigan City, Ind.
1—2

LEEDS & NORTHRUP CO., 4970 Stenton Ave., Philadelphia 44, Pa.
1—2—3

MANNING, MAXWELL & MOORE, INC., 250 E. Main, Stratford, Conn.
2—3

MINNEAPOLIS - HONEYWELL REGULATOR CO., BROWN INSTRUMENTS DIV., Wayne & Windrim Aves., Philadelphia 44, Pa.
1—2—3

NOBLE CO., 1860 Seventh St., Oakland 20, Calif.
1—2—3

PYROMETER INSTRUMENT CO., INC., 92 Portland Ave., Bergenfield, N. J.
3

WHEELCO INSTRUMENTS CO., 847 W. Harrison St., Chicago 7, Ill.
3

RECTIFIERS, Electric

●**ALLIS-CHALMERS MFG. CO.,** 975 So. 70th St., Milwaukee 1, Wis.

●**GENERAL ELECTRIC CO.,** 1 River Road, Schenectady 5, N. Y.

I-T-E CIRCUIT BREAKER CO., 19th and Hamilton St., Philadelphia 30, Pa.

●**SYNTRON CO.,** 450 Lexington Ave., Homer City, Pa.

WESTINGHOUSE ELECTRIC CO., First Nat'l Bank Bldg., Pittsburgh, Pa.

RECUPERATORS, Waste Heat

MANITOWOC ENGINEERING WORKS, Manitowoc, Wis.

REFRACTORIES, Block, Brick, Insulation

AMERICAN VERMICULITE CORP., 654 Madison Ave., New York 21, N. Y.

ARMSTRONG CORK COMPANY, Liberty Street, Lancaster, Pa.

●**THE BABCOCK & WILCOX CO.,** 85 Liberty St., New York 6, N. Y.

BOTFIELD REFRACTORIES CO., Swanson & Clymer Sts., Philadelphia 47, Pa.

THE CARBORUNDUM CO., REFRACTORIES DIV., Perth Amboy, N. J.

THE CARTER-WATERS CORP., 2440 Pennway, Kansas City 8, Mo.

CHICAGO FIRE BRICK CO., 1467 Elston Ave., Chicago 22, Ill.

CHICAGO STEEL FOUNDRY COMPANY, 3720 So. Kedzie Ave., Chicago 32, Ill.

THE DENVER FIRE CLAY CO., 2301 Blake St., Denver 17, Colo

THE DODSON MFG. CO. INC., 1463 Barwise, Wichita 2, Kans.

ELECTRIC STEEL FOUNDRY CO., 2141 N. W. 25th Ave., Portland 10, Ore.

GENERAL REFRACTORIES CO., 1520 Locust St., Philadelphia 2, Pa.

A. P. GREEN FIRE BRICK CO., 1018 E. Breckenridge, Mexico, Mo.

HARBISON - WALKER REFRACTORIES CO., 1800 Farmers Bank Bldg., Pittsburgh 22, Pa.

JOHNS-MANVILLE, 22 E. 40th St., New York 16, N. Y.

LACLEDE-CHRISTY CO., Iroquois Bldg., 3600 Forbes St., Pittsburgh 13, Pa.

MEXICO REFRACTORIES CO., Mex-R-Co. Bldg., Mexico, Mo.

THE PATTERSON FOUNDRY & MACHINE CO., 1250 St. George St., East Liverpool, Ohio

PUMICE AGGREGATE SALES CORP., 121 S. Yale Ave., Albuquerque, New Mex.

QUIGLEY COMPANY, INC., 527 Fifth Ave., New York 17, N. Y.

REFRACTORY & INSULATION CORP., 120 Wall St., New York 5, N. Y.

RICHARD C. REMMEY SON CO., Hedley St. & Delaware River, Philadelphia 24, Pa.

●**W. A. RIDDELL CORP.,** Bucyrus, Ohio

SPEEDBLOCK, INC., 1144 Union Commerce Bldg., Cleveland 14, Ohio

J. C. STEELE & SONS, INC., North Mulberry, Statesville, N.C.

WALSH REFRACTORIES CORP., 101 Ferry St., St. Louis 7, Mo.

WAUKESHA MOTOR CO., West St. Paul Ave., Waukesha, Wis.

ZONOLITE COMPANY, 135 So. LaSalle St., Chicago 3, Ill.

REGULATORS, Feed Water

MOSHER ELECTRONIC CONTROLS, 25 Boston Post Rd., Larchmont, N. Y.

REGULATORS, Draft, Pressure, Temperature (see Controls)

REGULATORS, Voltage

●**ALLIS - CHALMERS MFG. CO.,** 975 So. 70th St., Milwaukee 1, Wis.

●**GENERAL ELECTRIC CO.,** 1 River Road, Schenectady 5, N. Y.

RESPIRATORS

AMERICAN OPTICAL CO., Mechanic St., Southbridge, Mass.

THE DeVILBISS CO., 300 Phillips Ave., Toledo 1, Ohio

GENERAL SCIENTIFIC EQUIPMENT CO., 27th & Huntingdon Sts., Philadelphia 32, Pa.

WILLSON PRODUCTS, INC., 248 Washington St., Reading, Pa.

REVOLUTION COUNTERS (see Tachometers)

REVOLVING CRANES *(See Derricks, Stiffleg or Guy)*

RHEOSTATS

●**GENERAL ELECTRIC CO.,** 1 River Road, Schenectady 5, N. Y.

WESTINGHOUSE ELECTRIC CO., First Nat'l Bank Bldg., Pittsburgh, Pa.

ROCK SPLITTERS, for Stone-Faced Masonry

●**DES PLAINES CONCRETE MACHINERY CO.,** Box 152, Des Plaines, Ill.

SPLIT-ROCK PRODUCTS, 13201 W. Burleigh St., Milwaukee 10, Wis.

ROCK WOOL CUPOLAS & EQUIPMENT

WHITING CORP., 15693 Lathrop Ave., Harvey, Ill.

RODS, for Grinding Mills

●**ALLIS - CHALMERS MFG. CO.,** 975 S. 70th St., Milwaukee 1, Wis.

●**THE COLORADO FUEL & IRON CORP.,** P. O. Box 1920, Denver 1, Colo.

MANGANESE STEEL FORGE CO., Richmond St. & Castor Ave., Philadelphia 34, Pa.

THE MINE & SMELTER SUPPLY CO., 1422 17th St., Denver 17, Colo.

TRAYLOR ENGINEERING & MFG. CO., Allentown, Pa.

RODS, Welding, Hard-facing (see Welding Rods, Hard-facing)

RODS, Welding (see Welding Rods and Electrodes)

ROLLER BEARINGS (see Bearings)

ROOFING AND SIDING, Industrial

THE BARRETT DIV., ALLIED CHEMICAL & DYE CORP., 40 Rector St., New York 6, N. Y.

BASALT ROCK CO., INC., 8th & River Sts., Napa, Calif.

BETHLEHEM STEEL CO., 701 E. Third St., Bethlehem, Pa.

JOHNS-MANVILLE, 22 E. 40th St., New York 16, N. Y.

KOPPERS CO., INC., Koppers Bldg., Pittsburgh 19, Pa.

REPUBLIC STEEL CORP., Republic Bldg., Cleveland 1, Ohio

THE RUBEROID CO., 500 Fifth Ave., New York 18, N. Y.

TRUSCON STEEL CO., Albert St., Youngstown 1, Ohio

UNITED STATES STEEL CO., Pittsburgh 30, Pa.

ROPE, Manila, Sisal, Jute, Etc.

GREENVILLE MFG. WORKS, 112½ W. Fourth St., Greenville, Ohio

WALL ROPE WORKS, INC., 48 South St., New York 5, N. Y.

ROPE, Wire (see Wire Rope)

RUBBER LININGS (see Chute Linings, Rubber)

S

SAFETY EQUIPMENT, Goggles, Shoes, Etc.

AMERICAN OPTICAL CO., Southbridge, Mass.

E. D. BULLARD CO., 275 Eighth St., San Francisco 3, Calif.

EDMONT MANUFACTURING CO., 6th & Orange Sts., Coshocton, Ohio

GENERAL SCIENTIFIC EQUIPMENT CO., 27th & Huntingdon Sts., Philadelphia 32, Pa.

GOODALL RUBBER CO., Whitehead Road, Trenton 4, N. J.

●**B. F. GOODRICH,** Akron 11, Ohio

INDUSTRIAL PRODUCTS CO., 2705 N. Fourth St., Philadelphia 33, Pa.

LEHIGH SAFETY SHOE CO., 31 S. 7th St., Allentown, Pa.

MONTGOMERY & CO., INC., 53 Park Pl., New York 7, N. Y.

UNITED STATES RUBBER CO., 1230 Ave. of the Americas, New York 20, N. Y.

WILLSON PRODUCTS, INC., 248 Washington St., Reading, Pa.

SAMPLING EQUIPMENT

ACKER DRILL CO., INC., 725 W. Lackawanna Ave., Scranton 3, Pa.

● A dot before name indicates advertiser in this issue. See advertiser index.

DIRECTORY

●**ALLIS-CHALMERS MFG. CO.**, 975 S. 70th St., Milwaukee 1, Wis.

●**FULLER COMPANY**, Fuller Bldg., Catasauqua, Pa.

THE GALIGHER COMPANY, 545 W. 8th South, Salt Lake City, Utah

HARDINGE CO., INC., 240 Arch St., York, Pa.

HUMBOLDT MFG. CO., 2014 N. Whipple St., Chicago 47, Ill.

THE MINE & SMELTER SUPPLY CO., 1422 17th St., Denver 17, Colo.

SPRAGUE & HENWOOD, INC., 221 W. Olive St., Scranton 2, Pa.

STURTEVANT MILL CO., 102 Clayton St., Boston 22, Mass.

SAND DRAGS (see Sand Recovery Machinery)

SAND-LIME BRICK MACHINERY (see Brick Machinery)

SAND RECOVERY MACHINERY, Cones, Classifiers, Dewaterers, Drags, Etc.

ACME ROAD MACHINERY CO., East Main Street, Frankfort, N. Y.

ALLEN CONE & MACHINERY CORP., 120 Broadway, New York 5, N. Y.

●**ALLIS-CHALMERS MFG. CO.**, 975 S. 70th St., Milwaukee 1, Wis.

ANDERSON ENGINEERING CO., 237 Bent St., Cambridge 41, Mass.

ATLAS CORPORATION, Mountville, Pa.

BIRD MACHINE CO., South Walpole, Mass.

BODINSON MFG. CO., 2401 Bayshore Blvd., San Francisco 24, Calif.

COLORADO IRON WORKS CO., 1624 17th St., Denver 2, Colo.

THE CONVEYOR CO., 3260 East Slauson Ave., Los Angeles 11, Calif.

THE DEISTER CONCENTRATOR CO., P. O. Box 1, Fort Wayne 1, Ind.

●**DIAMOND IRON WORKS, INC.**, 1728 N. 2nd Street, Minneapolis 11, Minn.

●**THE DORR CO., INC.**, Barry Place, Stamford, Conn.

●**EAGLE IRON WORKS**, 137 Holcomb Ave., Des Moines 4, Iowa

GENERAL AMERICAN TRANSPORTATION CORP., Field Bldg., Room 3105, 135 So. LaSalle St., Chicago 90, Ill.

GEORGIA IRON WORKS, 605 12th St., Augusta, Ga.

GREENVILLE MFG. WORKS, Greenville, Ohio

●**GRUENDLER CRUSHER & PULVERIZER CO.**, 2920 N. Market St., St. Louis 6, Mo.

●**HARDINGE CO., INC.**, 240 Arch St., York, Pa.

●**ROBINS CONVEYORS DIV., HEWITT-ROBINS INC.**, 270 Passaic Ave., Passaic, N. J.

●**IOWA MFG. CO.**, 916 16th St., N. E., Cedar Rapids, Iowa

THE JEFFREY MFG. CO., 935 N. 4th St., Columbus 16, Ohio

●**KENNEDY VAN SAUN MFG. & ENG. CORP.**, 2 Park Ave., New York 16, N. Y.

●**LINK-BELT CO.**, 300 W. Pershing Road, Chicago 9, Ill.

●**LIPPMANN ENGINEERING WORKS**, 4603 W. Mitchell St., Milwaukee 14, Wis.

MANGANESE STEEL FORGE CO., Richmond St. & Castor Ave., Philadelphia 34, Pa.

E. F. MARSH ENG. CO., 4324 W. Clayton Ave., St. Louis 10, Mo.

MECKUM ENGINEERING, INC., Dayton Rd., Ottawa, Ill.

MILLVILLE IRON WORKS INC., 6th St. & Florence Ave., Millville, N. J.

MORSE BROS. MACHINERY CO., 2900 Brighton Blvd., Denver 1, Colo.

●**McLANAHAN AND STONE CORP.**, Hollidaysburg, Pa.

●**PETTIBONE MULLIKEN CORP., IMPACT MASTER DIVISION**, 4700 W. Division St., Chicago 51, Ill.

●**PIONEER ENG. WORKS, INC.**, 1515 Central Ave., Minneapolis 13, Minn.

ROGERS IRON WORKS CO., 11th & Pearl Sts., Joplin, Mo.

SIMPLICITY ENGINEERING CO., Durand, Mich.

●**SMITH ENGINEERING WORKS**, 532 E. Capitol Dr., Milwaukee 12, Wis.

STEPHENS-ADAMSON MFG. CO., 7 Ridgeway Ave., Aurora, Ill.

STRAUB MFG. CO., 456 Chestnut St., Oakland 7, Calif.

STURTEVANT MILL CO., 102 Clayton St., Boston 22, Mass.

THE W. S. TYLER CO., 3615 Superior Ave., Cleveland 14, Ohio

●**UNIVERSAL ENGINEERING CORP.**, 625 C Ave. N. W., Cedar Rapids, Iowa

UNIVERSAL ROAD MACHINERY CO., 27 Emerick St., Kingston, N. Y.

WEBSTER MFG. INC., Tiffin 16, Ohio

●**WESTERN MACHINERY CO.**, 760-766 Folsom St., San Francisco 7, Calif.

●**YUBA MFG. CO.**, 351 California St., San Francisco 4, Calif.

SANDERS, Cast Stone

●**CHICAGO PNEUMATIC TOOL CO.**, 6 East 44th St., New York 17, N. Y.

INDEPENDENT PNEUMATIC TOOL CO., 175 N. State St., Chicago 6, Ill.

SCALES, Batching (see Batchers)

SCALES, Conveyor (see Feeders)

SCALES, Hopper

ANCHOR CONCRETE MACHINERY CO., 1191 Fairview Ave., Columbus 12, Ohio

BEAUMONT-BIRCH CO., 1505 Race St., Philadelphia, Penna.

BONDED SCALE CO., 2166 S. 3rd St., Columbus, Ohio

●**BUTLER BIN CO.**, Box 407, Waukesha, Wis.

CONCRETE TRANSPORT MIXER CO., 4985 Fyler Ave., St. Louis 9, Mo.

THE CONVEYOR CO., 3260 E. Slauson Ave., Los Angeles 58, Calif.

FAIRBANKS MORSE & CO., 600 S. Michigan Ave., Chicago 5, Ill.

●**FLEMING MFG. CO., INC.**, 4985 Fyler Ave., St. Louis 9, Mo.

HARDY SCALES CO., 5701 So. Atlantic Blvd., Maywood, Calif.

THE HELTZEL STEEL FORM & IRON CO., 1750 Thomas Rd., Warren, Ohio

THE HOWE SCALE CO., Rutland, Vt.

●**THE C. S. JOHNSON CO.**, P.O. Box 71, Champaign, Ill.

MEYER SCALES, INC., 449 Central Ave., Orange, N. J.

NOBLE CO., 1860 Seventh St., Oakland 20, Calif.

RICHARDSON SCALE CO., Van Houton Ave., Clifton, N. J.

SCIENTIFIC CONCRETE SERVICE CORP., 724 Salem Ave., Elizabeth 3, N. J.

TOLEDO SCALE CO., 1090 Telegraph Road, Toledo 12, Ohio

THE WEBB CORP., 402 E. Broadway, Webb City, Mo.

WINSLOW GOVT. STANDARD SCALE WKS., INC., 25th and Haythorne Ave., Terre Haute, Ind.

THE YALE & TOWNE MFG. CO., Philadelphia 15, Pa.

SCALES, Laboratory

CENTRAL SCIENTIFIC CO., 1700 Irving Park Rd., Chicago 13, Ill.

●**DENVER EQUIPMENT CO.**, 1410 Seventeenth St., Denver 17, Colo.

FAIRBANKS MORSE & CO., 600 S. Michigan Ave., Chicago 5, Ill.

FISHER SCIENTIFIC CO., 717 Forbes St., Pittsburgh 19, Pa.

●**FLEMING MFG. CO.**, 4985 Fyler Ave., St. Louis, Mo.

GENERAL SCIENTIFIC EQUIPMENT CO., 27th & Huntingdon Sts., Philadelphia 32, Pa.

THE HOWE SCALE CO., Rutland, Vt.

HUMBOLDT MFG. CO., 2014 N. Whipple St., Chicago 47, Ill.

TOLEDO SCALE CO., 1090 Telegraph Road, Toledo 12, Ohio

SCALES, Lorry (see Weigh Lorries)

SCALES, Proportioning (see Batchers)

SCALES, Truck, Railway

BONDED SCALE & MACHINE CO., 41 Bellview Ave., Columbus 7, Ohio

FAIRBANKS MORSE & CO., 600 S. Michigan Ave., Chicago 5, Ill.

GREENVILLE MFG. WORKS, 112½ W. Fourth St., Greenville, Ohio

HARDY SCALES CO., 5701 So. Atlantic Blvd., Maywood, Calif.

THE HOWE SCALE CO., Rutland, Vt.

MEYER SCALES, INC., 449 Central Ave., Orange, N. J.

STREETER-AMET CO., 4101 N. Ravenswood, Chicago 13, Ill.

TOLEDO SCALE CO., 1090 Telegraph Road, Toledo 12, Ohio

THE WEBB CORP., 402 E. Broadway, Webb City, Mo.

WINSLOW GOVT. STANDARD SCALE WKS., INC., 25th and Haythorne Ave., Terre Haute, Ind.

THE YALE & TOWNE MFG. CO., Philadelphia 15, Pa.

SCRAPERS, Power Drag (see Cable Excavators)

SCRAPERS, Tractor

●**BUCYRUS-ERIE CO.**, South Milwaukee, Wis.

●**CATERPILLAR TRACTOR CO.**, Peoria 8, Ill.

●**THE EUCLID ROAD MACHNRY. CO.**, 1361 Chardon Road, Cleveland 17, Ohio

THE HEIL CO., 3000 W. Montana St., Milwaukee 1, Wis.

ISAACSON IRON WORKS, Box 3028, Seattle 14, Wash.

HENNEUSE ENGINEERING CO., Marion, Ohio

LAPLANT-CHOATE MFG. CO. INC., 2920 1st Ave. N. E., Cedar Rapids, Iowa

●**R. G. LeTOURNEAU, INC.**, 2301 N. Adams St., Peoria, Ill.

SHEPPARD DIESELS, Philadelphia St., Hanover, Pa.

SOUTHWEST WELDING & MFG. CO., 3201 W. Mission Road, Alhambra, Calif.

WOOLDRIDGE MANUFACTURING CO., Sunnyvale, Calif.

SCREEN CLOTH, Woven-Wire (see Wire Cloth)

SCREEN PLATE, Perforated

THE ABBEY-SCHERER CO., 304 Railroad St., El Monte, Calif.

AMERICAN BRAKE SHOE CO., 230 Park Ave., New York 17, N. Y.

BODINSON MFG. CO., 2401 Bayshore Blvd., San Francisco 24, Calif.

THE C. S. CARD IRON WORKS CO., P.O. Box 117, Denver 1, Colo.

THE CALIFORNIA WIRE CLOTH CORP., 1080 19th Ave., Oakland 6, Calif.

CHICAGO PERFORATING CO., 2445 W. 24th Pl., Chicago 8, Ill.

CHICAGO STEEL FOUNDRY COMPANY, 3720 S. Kedzie Ave., Chicago 32, Ill.

THE COLORADO FUEL & IRON CORP., P. O. Box 1920, Denver 1, Colo.

●**CROSS ENGINEERING CO.**, Dundaff St., P. O. Box 507, Carbondale, Pa.

●**EAGLE IRON WORKS**, 137 Holcomb Ave., Des Moines 4, Iowa

●**THE FROG, SWITCH & MFG. CO.**, Carlisle, Pa.

GREENVILLE MFG. WORKS, 112½ W. Fourth St., Greenville, Ohio

GRUENDLER CRUSHER & PULVERIZER CO., 2920 N. Market St., St. Louis 6, Mo.

HARRINGTON & KING PERFORATING CO., 5655 Fillmore St., Chicago 44, Ill.

●**HENDRICK MFG. CO.**, Carbondale, Pa.

●**ROBINS CONVEYORS DIV., HEWITT-ROBINS INC.**, 270 Passaic Ave., Passaic, N. J.

KENSINGTON STEEL CO., 505 Kensington St., Chicago 28, Ill.

MANGANESE STEEL FORGE CO., Richmond St., & Castor Ave., Philadelphia 34, Pa.

McNALLY PITTSBURGH MFG. CORP., Pittsburg, Kans.

MECKUM ENGINEERING, INC., Dayton Rd., Ottawa, Ill.

CHARLES MUNDT & SONS, 53 Fairmount Ave., Jersey City 4, N. J.

SIMPLICITY ENGINEERING CO., Durand, Mich.

●**SMITH ENGINEERING WORKS**, 532 E. Capitol Dr., Milwaukee 12, Wis.

STANDARD STAMPING & PERFORATING CO., 3131 W. 49th Place, Chicago 32, Ill.

STEPHENS-ADAMSON MFG. CO., 7 Ridgeway Ave., Aurora, Ill.

●**TAYLOR-WHARTON IRON & STEEL CO.**, High Bridge, N. J.

UNITED IRON WORKS CO., 108 No. Locust, Pittsburg, Kans.

UNIVERSAL ROAD MACHINERY CO., 27 Emerick St., Kensington, N. Y.

SCREENING PLANTS, Portable (see Crushing and Screening Plants Portable)

● A dot before name indicates advertiser in this issue. See advertiser index.

DIRECTORY

SCREENS

1. Gravity
2. Grizzley
3. Laboratory
4. Revolving
5. Scrubber
6. Vibrating & Shaker
7. Gyrating

ABBE ENGINEERING CO., 50 Church St., New York 7, N. Y.
4

ACME ROAD MACHINER CO., East Main Street, Frankfort, N. Y.
1—2—4—5—6

ALLEN CONE & MACHINERY CORP., 120 Broadway, New York 5, N. Y.
6

ALLIED WELDING & MFG. CO. INC., 49 Lorna Doone Blvd., Orlando, Fla.
4—6

•**ALLIS-CHALMERS MFG. CO.,** 975 So. 70th St., Milwaukee 1, Wis.
2—4—5—6

AMERICAN BRAKE SHOE CO., 230 Park Ave., New York 17, N. Y.
2—4—6

ANCHOR CONCRETE MACHINERY CO., 1191 Fairview Ave., Columbus 12, Ohio

•**AUSTIN-WESTERN CO.,** Aurora, Ill.
4—6

THE C. O. BARTLETT AND SNOW CO., 6200 Harvard Ave., Cleveland 5, Ohio
4

BODINSON MFG. CO., 2401 Bayshore Blvd., San Francisco 24, Calif.
4—5—6

BONDED SCALE & MACHINE CO., 41 Bellview Ave., Columbus 7, Ohio
6

CENTRAL SCIENTIFIC CO., 1700 Irving Park Rd., Chicago 13, Ill.
3

•**CHICAGO PERFORATING CO.,** 2445 W. 24th Pl., Chicago 8 Ill.
3—4—5—6

CHICAGO STEEL FOUNDRY CO., 3720 So. Kedzie Ave., Chicago 32, Ill.
6

•**THE COLORADO FUEL & IRON CORP.,** Continental Oil Bldg., Denver 2, Colo.
2—6

THE CONVEYOR CO., 3260 East Slauson Ave., Los Angeles 11, Calif.
1—2—3—4—5—6

THE DEISTER CONCENTRATOR CO., P. O. Box 1, Fort Wayne 1, Ind.
6

•**DEISTER MACHINE CO.,** 1933 East Wayne St., Fort Wayne 4, Ind.
6

•**DENVER EQUIPMENT CO.,** 1410 Seventeenth St., Denver 17, Colo.
3—6

•**DIAMOND IRON WORKS, INC.,** 1728 2nd St. No., Minneapolis 11, Minn.
2—4—5—6

ELECTRIC STEEL FOUNDRY CO., 2141 N. W. 25th Ave., Portland 10, Ore.
2—4

FISHER SCIENTIFIC CO., 717 Forbes St., Pittsburgh 19, Pa.
3

THE GILSON SCREEN CO., 119 E. Market St., Mercer, Pa.
3

GREENVILLE MFG. WORKS, 1121½ W. Fourth St., Greenville, Ohio
1—2—4—5—6

•**GRUENDLER CRUSHER & PULVERIZER CO.,** 2920 N. Market St., St. Louis 6, Mo.
1—2—4—5—6

GEORGE HAISS MFG. CO., INC., Park Ave. and 143rd St., New York 51, N. Y.
1—2—3

•**HENDRICK MFG. CO.,** P.O. Box 497, Carbondale, Pa.
1—2—3—4—5—6

•**ROBINS CONVEYORS DIV., HEWITT-ROBINS INC.,** 270 Passaic Ave., Passaic, N. J.
2—6

ROBERT HOLMES & BROS. INC., 3519 Junction Ave., Danville, Ill.
2—3—6

HUMBOLDT MFG. CO., 2014 N. Whipple St., Chicago 47, Ill.
3

•**IOWA MFG. CO.,** 916 16th St., N.E., Cedar Rapids, Iowa
1—2—4—6

THE JEFFREY MFG. CO., 935 N. 4th St., Columbus 16, Ohio
2—6

•**KENNEDY VAN SAUN MFG. & ENG. CORP.,** 2 Park Ave., New York 16, N. Y.
1—2—4—5—6

•**KOLMAN MFG. CO.,** Sioux Falls, S. D.

•**LINK-BELT CO.,** 300 W. Pershing Road, Chicago 9, Ill.
4—5—6

•**LIPPMANN ENGINEERING WORKS,** 4603 W. Mitchell St., Milwaukee 14, Wis.
1—2—4—5—6

MANGANESE STEEL FORGE CO., Richmond St. & Castor Ave., Philadelphia 34, Pa.
1—2—4—5

MILLVILLE IRON WORKS INC., 6th St. & Florence Ave., Millville, N. J.
4

McFARLANE-EGGERS MACHINERY CO., 2763 Blake St., Denver 5, Colo.
4—6

•**McLANAHAN AND STONE CORP.,** Hollidaysburg, Pa.
2—4—5—6

McNALLY-PITTSBURG MFG. CORP., Pittsburg, Kans.
1—2—4—6

MULTI-METAL WIRE CLOTH CO., INC., 1358 Garrison Ave., New York 59, N. Y.
6

•**NORDBERG MFG. CO.,** 3073 So. Chase Ave., Milwaukee 7, Wis.
2—6

OVERSTROM & SONS, 2213 W. Mission Road, Alhambra, Calif.
3—6

THE PATTERSON FOUNDRY & MACHINE CO., 1250 St. George St., East Liverpool, Ohio
7

•**PETTIBONE MULLIKEN CORP., IMPACT MASTER DIV.,** 4700 W. Division St., Chicago 51, Ill.
2—4—5—6

•**PIONEER ENG. WORKS, INC.,** 1515 Central Ave., Minneapolis 13, Minn.
4—6

PRECISION SCIENTIFIC CO., 3737 W. Cortland St., Chicago 47, Ill.

•**PRODUCTIVE EQUIPMENT CORP.,** 2926 W. Lake St., Chicago 12, Ill.
2—3—6

•**W. A. RIDDELL CORP.,** Bucyrus, Ohio
1—6

JOHN A. ROEBLING'S SONS CO., 640 S. Broad St., Trenton 2, N. J.
6

ROGERS IRON WORKS CO., 11th & Pearl Sts., Joplin, Mo.
2—4—5—6

•**ROSS SCREEN & FEEDER CO.,** 19 Rector St., New York 6, N. Y.
2

•**SCREEN EQUIPMENT CO., INC.,** Buffalo 21, N. Y.
6

SEPARATIONS ENGINEERING CORP., 110 E. 42nd St., New York 17, N. Y.
1—3—5—6

SIMPLICITY ENGINEERING CO., Durand, Mich.
2—6

THE ORVILLE SIMPSON COMPANY, 1230 Knowlton St., Cincinnati 23, Ohio

•**SMITH ENGINEERING WORKS,** 532 E. Capitol Dr., Milwaukee 12, Wis.
1—2—3—4—5—6

SOUTHWESTERN ENGINEERING CO., 4800 Santa Fe Ave., Los Angeles 58, Calif.

STEDMAN FOUNDRY & MACHINE CO., INC., Indiana Ave., Aurora, Ind.
6

STEPHENS-ADAMSON MFG. CO., 7 Ridgeway Ave., Aurora, Ill.
2—4—5—6

STRAUB MFG. CO., 456 Chestnut St., Oakland 7, Calif.
2—4—5—6

STURTEVANT MILL CO., 102 Clayton St., Boston 22, Mass.
3—6

•**SYNTRON CO.,** 450 Lexington Ave., Homer City, Pa.
2—6

TAYLOR-WHARTON IRON & STEEL CO., High Bridge, N. J.
2

TRAYLOR ENGINEERING & MFG. CO., Allentown, Pa.
2—4—5

TRIANGLE ENGINEERING CO., 2848 W. 26th St., Chcago 23, Ill.
6

TROWBRIDGE CONVEYOR CO., 860 Van Houten Ave., Clifton, New Jersey
6

THE W. S. TYLER CO., 3615 Superior Ave., Cleveland 14, Ohio
1—2—3—5—6

UNITED IRON WORKS CO., 108 No. Locust, Pittsburg, Kans.
1—2—4—6

•**UNIVERSAL ENGINEERING CORP.,** 625 C Ave. N.W., Cedar Rapids, Iowa
4—5—6

UNIVERSAL ROAD MACHINERY CO., 27 Emerick St., Kingston, N. Y.
2—4—5—6

VERNON TOOL CO., LTD., 1101 Meridian Ave., Alhambra, Calif.
6

VIBRO-PLUS PRODUCTS, INC., 54-11 Queens Blvd., Woodside, L. I., N. Y.
6

WEBSTER MFG. INC., Tiffin 16 Ohio
1—2—4

•**WILLIAMS PATENT CRUSHER & PULV. CO.,** 2701 N. Broadway, St. Louis 6, Mo.
6

•**YUBA MFG. CO.,** 351 California St., San Francisco 4, Calif.
4

SCREW CONVEYORS (see Conveyors, Screw)

SCRUBBERS, Crushed Stone, Gravel

ACME ROAD MACHINERY CO., East Main Street, Frankfort, N. Y.

•**ALLIS-CHALMERS MFG. CO.,** 975 So. 70th St., Milwaukee 1, Wis.

AUSTIN-WESTERN CO., Aurora, Ill.

BODINSON MFG. CO., 2401 Bayshore Blvd., San Francisco 24, Calif.

THE CONVEYOR CO., 3260 East Slauson Ave., Los Angeles 11, Calif.

•**DIAMOND IRON WORKS, INC.,** 1728 North 2nd St., Minneapolis 11, Minn.

•**THE DORR CO., INC.,** Barry Place, Stamford, Conn.

•**EAGLE IRON WORKS,** 137 Holcomb Ave., Des Moines 4, Iowa

GEORGIA IRON WORKS CO., 605 12th St., Augusta, Ga.

GREENVILLE MFG. WORKS, Greenville, Ohio

•**GRUENDLER CRUSHER & PULVERIZER CO.,** 2920 N. Market St., St. Louis 6, Mo.

•**IOWA MFG. CO.,** 916 16th St. N.E., Cedar Rapids, Iowa

•**KENNEDY VAN SAUN MFG. & ENG. CORP.,** 2 Park Ave., New York 16, N. Y.

•**LINK-BELT CO.,** 300 W. Pershing Road, Chicago 9, Ill.

•**LIPPMANN ENGINEERING WORKS,** 4603 W. Mitchell St., Milwaukee 14, Wis.

MANGANESE STEEL FORGE CO., Richmond St. & Castor Ave., Philadelphia 34, Pa.

E. F. MARSH ENG. CO., 4324 W. Clayton Ave., St. Louis 10, Mo.

MECKUM ENGINEERING, INC., Dayton Rd., Ottawa, Ill.

•**McLANAHAN AND STONE CORP.,** Hollidaysburg, Pa.

•**PETTIBONE MULLIKEN CORP., IMPACT MASTER DIV.,** 4700 W. Division St., Chicago 51, Ill.

•**PIONEER ENG. WORKS, INC.,** 1515 Central Ave., Minneapolis 13, Minn.

ROGERS IRON WORKS CO., 11th & Pearl Sts., Joplin, Mo.

•**SMITH ENGINEERING WORKS.,** 532 E. Capitol Dr., Milwaukee 12, Wis.

STEPHENS-ADAMSON MFG. CO., 7 Ridgeway Ave., Aurora, Ill.

STRAUB MFG. CO., 507 Chestnut St., Oakland 7, Calif.

•**TRAYLOR ENGINEERING & MFG. CO.,** Allentown, Pa.

UNITED IRON WORKS CO., 108 No. Locust, Pittsburg, Kans.

•**UNIVERSAL ENGINEERING CORP.,** 625 C Ave. N.W., Cedar Rapids, Iowa

UNIVERSAL ROAD MACHINERY CO., 27 Emerick St., Kingston, N. Y.

•**WESTERN MACHINERY CO.,** 760 Folsom, San Francisco 7, Cal.

WEBSTER MFG. INC., Tiffin 16, Ohio

SEAL RINGS, Kiln

•**ALLIS-CHALMERS MFG. CO.,** 975 S. 70th Street, Milwaukee 1, Wis.

MANITOWOC ENGINEERING WORKS, Manitowoc, Wis.

•**F. L. SMIDTH & CO.,** 11 W. 42nd St., New York 18, N. Y.

SOUTHWESTERN ENGINEERING CO., 4800 Santa Fe Ave., Los Angeles 58, Calif.

SEPARATORS, Air (see Air Separators)

SEPARATORS, Electrostatic (see Classifiers)

SEPARATORS, Magnetic (see Magnetic Separators)

• A dot before name indicates advertiser in this issue. See advertiser index.

DIRECTORY

SHEAVES

1. Wire Rope
2. V. Belt

●**ALLIS-CHALMERS MFG. CO.,** 975 So. 70th St., Milwaukee 1, Wis.
2

●**AMERICAN HOIST & DERRICK** 63 S. Robert St., St. Paul 1, Minn.

●**AMERICAN MANGANESE STEFL DIV. OF AMERICAN BRAKE SHOE CO.,** 377 E. 14th St., Chicago Heights, Ill.
1

THE C. O. BARTLETT AND SNOW CO., 6200 Harvard Ave., Cleveland 5, Ohio
1

BERGEN MACHINE & TOOL CO., INC., 189 Franklin Ave., Nutley 10, N. J.
2

BETHLEHEM STEEL CO., 701 E. Third St., Bethlehem, Pa.
1—2

●**BOSTON WOVEN HOSE & RUBBER CO.,** P.O. Box 1071, Boston 3, Mass.
2

THE C. S. CARD IRON WORKS CO., P.O. Box 117, Denver 1, Colo.
1

CHICAGO STEEL FOUNDRY CO., 3720 So. Kedzie Ave., Chicago 32, Ill.
1

CONTINENTAL GIN CO., P. O. Box 2614, Birmingham, Ala.
2

THE DAYTON RUBBER CO., Dayton 1, Ohio
2

●**DIAMOND IRON WORKS, INC.,** 1728 N. 2nd Street, Minneapolis 11, Minn.

R. & J. DICK CO., INC., P. O. Box 388, Passaic, N. J.
2

DODGE MANUFACTURING CORP., Mishawaka, Ind.
2

DOWNS CRANE & HOIST CO., 540 W. Vernon Ave., Los Angeles 37, Calif.
1—2

●**THE J. B. EHRSAM & SONS MFG. CO.,** Enterprise, Kans.
1—2

ELECTRIC STEEL FOUNDRY CO., 2141 N. W. 25th Ave., Portland 10, Ore.
1

FARRELL-CHEEK STEEL CO., Sandusky, Ohio
1

●**THE FROG, SWITCH & MFG. CO.,** Carlisle, Pa.
1

GAR-BRO MFG. CO., 2416 E. 16th St., Los Angeles 21, Calif.
1

THE GATES RUBBER CO., 999 S. Broadway, Denver 17, Colo.
2

GREENVILLE MFG. WORKS, 112½ W. Fourth St., Greenville, Ohio

HARDSOCG PNEUMATIC TOOL CO., 225 S. Benton St., Ottumwa, Iowa
2

ROBERT HOLMES & BROS. INC., 3519 Junction Ave., Danville, Ill.
1

●**IOWA MFG. CO.,** 916 16th St. N. E., Cedar Rapids, Iowa

W. A. JONES FOUNDRY & MACHINE CO., 4401 Roosevelt Rd., Chicago 24, Ill.
1—2

●**JOY MANUFACTURING CO.,** Henry W. Oliver Bldg., Pittsburgh 22, Pa.
1

KENSINGTON STEEL CO., 505 Kensington St., Chicago 28, Ill.
1

THE LOOMIS MACHINE CO., 15 E. Market St., Tiffin, Ohio
1

LOVEJOY FLEXIBLE COUPLING CO., 5009 W. Lake St., Chicago 44, Ill.
2

MADESCO TACKLE BLOCK CO., P. O. Box 148, Easton, Pa.
1

THE MEDART CO., 100 Potomac St., St. Louis 18, Mo.
1—2

●**McLANAHAN AND STONE CORP.,** Hollidaysburg, Pa.
2

McNALLY PITTSBURGH MFG. CORP., Pittsburg, Kans.
2

NICE BALL BEARING CO., 30th and Hunting Park Ave., Philadelphia 40, Pa.
1

PYOTT FOUNDRY & MACHINE CO., 328 No. Sangamon St., Chicago 7, Ill.
1—2

●**SAUERMAN BROS., INC.,** 530 S. Clinton St., Chicago 7, Ill.
1

●**TAYLOR-WHARTON IRON & STEEL CO.,** High Bridge, N. J.
1

UNITED IRON WORKS CO., 108 No. Locust, Pittsburg, Kans.
1—2

VULCAN IRON WORKS, 700 So. Main St., Wilkes-Barre, Pa.
1

WEBSTER MFG. INC., Tiffin 16, Ohio
1

WIS. FOUNDRY & MACHINE CO., 623 E. Main St., Madison, Wis.
1—2

WORTHINGTON PUMP & MACHINERY CORP., Worthington Ave., Harrison, N. J.
1

SHOVELS, Crawler Mounted

1. Diesel
2. Electric
3. Gasoline
4. Electric Generator

●**AMERICAN HOIST & DERRICK CO.,** 63 S. Robert St., St. Paul 1, Minn.
1—2—3

ATHEY PRODUCTS CORP., 5631 W. 65th St., Chicago 38, Ill.
1

●**AUSTIN-WESTERN CO.,** Aurora, Ill.
1—3

BAY CITY SHOVELS, INC., Bay City, Mich.
1—2— 3

THE BROWNING CRANE & SHOVEL CO., 16226 Waterloo Road, Cleveland 10, Ohio
1—3

●**BUCYRUS-ERIE CO.,** South Milwauke, Wis.
1—2—3—4

THE BYERS MACHINE CO., Lock Box 390, Ravenna, Ohio
1—3

DEMPSTER BROTHERS, INC., Springdale St., Knoxville 17, Tenn.
1—3

THE EIMCO CORP., P. O. Box 300, Salt Lake City 10, Utah
1—2—3

ELECTRIC STEEL FOUNDRY CO., 2141 N. W. 25th Ave., Portland 10, Ore.
2

THE HANSON CLUTCH & MACHINERY CO., Wall & Miami Sts., Tiffin 15, Ohio
1—3

●**THE FRANK G. HOUGH CO.,** Sunnyside Ave., Libertyville, Ill.
1—3

HYSTER CO., 2918 N. E. Clackamas, Portland 8, Oregon
3

INSLEY MFG. CORP., 801 N. Olney, Indianapolis 1, Ind.
1—2—3—4

KEYSTONE DRILLER CO., 8th Ave., Beaver Falls, Pa.
1—2

●**KOEHRING CO.,** 3026 W. Concordia Ave., Milwaukee 16, Wis.
1—2—3—4

LIMA SHOVEL & CRANE DIV., OF BALDWIN-LIMA-HAMILTON CORP., South Main St., Lima, Ohio
1—2—3

LINK-BELT SPEEDER CORP., 1201 Sixth St. S. W., Cedar Rapids, Iowa
1—2—3—4

MANITOWOC ENGINEERING WORKS, Manitowoc, Wis.
1—2—3—4

MARION POWER SHOVEL CO., 617 W. Center St., Marion, Ohio
1—2—3

MICHIGAN POWER SHOVEL CO., 250 Miller Road, Benton Harbor, Mich.
1—2—3

●**NORTHWEST ENGINEERING CO.,** 135 S. LaSalle St., Chicago 3, Ill.
1—2—3—4

ORTON CRANE & SHOVEL CO., 608 S. Dearborn St., Chicago 5, Ill.
1—2—3

●**THE OSGOOD CO.,** Marion, Ohio
1—2—3

●**THE THEW SHOVEL CO.,** 1000 E. 28th St., Lorain, Ohio
1—2—3—4

TRACTOMOTIVE CORP., County Line Road, Deerfield, Ill.
1

●**UNIT CRANE & SHOVEL CORP.,** 6411 W. Burnham St., Milwaukee 14, Wis.
1—3

WAYNE CRANE DIV. AMERICAN STEEL DREDGE CO., INC., P. O. Box 570, Fort Wayne 1, Ind.
1—3

SHOVELS, Tractor

●**ALLIS-CHALMERS MFG. CO., TRACTOR DIVN.,** P.O. Box 512, Milwaukee 1, Wis.

ATHEY PRODUCTS CO., 5631 W. 65th St., Chicago 38, Ill.

●**BUCYRUS-ERIE CO.,** South Milwaukee, Wis.

THE EIMCO CORP., P. O. Box 300, Salt Lake City 10, Utah

HENNEUSE ENGINEERING CO., Marion, Ohio

●**THE FRANK G. HOUGH CO.,** Sunnyside Ave., Libertyville, Ill.

HYSTER CO., 2918 N. E. Clackamas, Portland 8, Oregon

INSLEY MFG. CORP., 801 N. Olney, Indianapolis 1, Ind.

LESSMANN MANUFACTURING CO., E. 20th & Easton Blvd., Des Moines 4, Iowa

LIMA SHOVEL & CRANE DIV., OF BALDWIN-LIMA-HAMILTON CORP., South Main St., Lima, Ohio

LINK-BELT SPEEDER CORP., 1201 Sixth St., S.W., Cedar Rapids, Iowa

LULL MFG. CO., 3612 E. 44th St., Minneapolis 6, Minn.

MAINE STEEL INC., South Windham, Me.

MANDT MFG. CO., 490 W. Goodale St., Columbus 8, Ohio

MANITOWOC ENGINEERING WORKS, Manitowoc, Wis.

THE OLIVER CORP., INDUSTRIAL DIV., 19300 Euclid Ave., Cleveland 17, Ohio

OTTAWA STEEL PRODUCTS CO., Ottawa, Kansas

SHEPPARD DIESELS, Philadelphia St., Hanover, Pa.

SOUTHWEST WELDING & MFG. CO., 3201 W. Mission Road, Alhambra, Calif.

●**TRACKSON COMPANY,** 3333 S. Chase Ave., Milwaukee 7, Wis.

TRACTOMOTIVE CORP., County Line Road, Deerfield, Ill.

SHOVELS, Truck-Mounted

●**AMERICAN HOIST & DERRICK CO.,** 63 S. Robert St., St. Paul 1, Minn.

BAY CITY SHOVELS, INC., Bay City, Mich.

THE BROWNING SCALE & SHOVEL CO., 16226 Waterloo Rd., Cleveland 10, Ohio

●**BUCYRUS-ERIE CO.,** South Milwaukee, Wis.

THE BYERS MACHINE CO., Lock Box 390, Ravenna, Ohio

THE EIMCO CORP., P. O. Box 300, Salt Lake City 10, Utah

THE FOUR WHEEL DRIVE AUTO CO., Clintonville, Wis.

THE HANSON CLUTCH & MACHINERY CO., Wall & Miami Sts., Tiffin 15, Ohio

INSLEY MFG. CORP., 801 N. Olney, Indianapolis 1, Ind.

●**KOEHRING CO.,** 3026 W. Concordia Ave., Milwaukee 16, Wis.

LIMA SHOVEL & CRANE DIV., OF BALDWIN-LIMA-HAMILTON CORP., South Main St., Lima, Ohio

LINK-BELT SPEEDER CORP., 1201 Sixth St. S.W., Cedar Rapids, Iowa

MICHIGAN POWER SHOVEL CO., 250 Miller Road, Benton Harbor, Mich.

●**NORTHWEST ENGINEERING CO.,** 135 S. LaSalle St., Chicago 3, Ill.

ORTON CRANE & SHOVEL CO., 608 S. Dearborn St., Chicago 5, Ill.

●**THE OSGOOD CO.,** Marion, Ohio

●**"QUICK-WAY" TRUCK SHOVEL CO.,** 2401 E. 40th Ave., Denver 5, Colo.

●**SCHIELD BANTAM CO.,** 216 Park St., Waverly, Iowa

●**THE THEW SHOVEL CO.,** 1000 E. 28th St., Lorain, Ohio

●**UNIT CRANE & SHOVEL CORP.,** 6411 W. Burnham St., Milwaukee 14, Wis.

WAYNE CRANE DIV., AMERICAN STEEL DREDGE CO., INC., P. O. Box 570, Fort Wayne 1, Ind.

SHREDDERS, Plaster

ABBE ENGINEERING CO., 50 Church St., New York 7, N. Y.

THE JEFFREY MFG. CO., 935 N. 4th St., Columbus 16, Ohio

●**WILLIAMS PATENT CRUSHER & PULV. CO.,** 2701 N. Broadway, St. Louis 6, Mo.

SIEVES, Testing

FISHER SCIENTIFIC CO., 717 Forbes St., Pittsburgh 19, Pa.

HUMBOLDT MFG. CO., 2014 N. Whipple St., Chicago 47, Ill.

PRECISION SCIENTIFIC CO., 3737 W. Cortland St., Chicago 47, Ill.

STURTEVANT MILL CO., 102 Clayton St., Boston 22, Mass.

●**SYNTRON CO.,** 450 Lexington, Homer City, Pa.

THE W. S. TYLER CO., 3615 Superior Ave., Cleveland 14, Ohio

● A dot before name indicates advertiser in this issue. See advertiser index.

DIRECTORY

SILOS, Storage

BASALT ROCK CO., INC., 8th & River Sts., Napa, Calif.

•**BAUGHMAN MFG. INC.,** 1000 Shipman Road, Jerseyville, Ill.

BEAUMONT-BIRCH CO., 1503 Race St., Philadelphia 2, Pa.

BIRMINGHAM TANK CO., DIV. OF INGALLS IRON WKS. CO., P. O. Drawer 1490, Birmingham 1, Ala.

THE BONNOT CO., 722 Mulberry S.E., Canton 2, Ohio

THE BRADY CONVEYORS CORP., 20 W. Jackson Blvd., Chicago 4, Ill.

CONCRETE SILO CO., P. O. Box 346, Bloomfield, Ind.

CONCRETE TRANSPORT MIXER CO., 4985 Fyler Ave., St. Louis 9, Mo.

THE CONVEYOR CO., 3260 East Slauson Ave., Los Angeles 11, Calif.

THE DODSON MFG. CO., 1463 Barwise Ave., Wichita 2, Kans.

ERIE STEEL CONST. CO., Geist Rd. and N.P.R.R., Erie, Penna.

•**FLEMING MFG. CO.,** 4985 Fyler Ave., St. Louis, Mo.

GREENVILLE MFG. WORKS, 112½ W. Fourth St., Greenville, Ohio

THE HELTZEL STEEL FORM & IRON CO., 1750 Thomas Rd., Warren, Ohio

THE MARIETTA CONCRETE CORP., Westview, Box 356, Marietta, Ohio

THE NEFF & FRY CO., 150 S. Main St., Camden, Ohio

NICHOLSON CO., 10 Rockefeller Plaza, New York 20, N. Y.

SINTERING MACHINERY

•**BESSER MFG. CO.,** 205 47th St., Alpena, Mich.

•**KENNEDY VAN SAUN MFG. & ENG. CORP.,** 2 Park Ave., New York 16, N. Y.

THE MARIETTA CONCRETE CORP., Westview, Box 356, Marietta, Ohio

McFARLANE-EGGERS MCHY. CO., 2763 Blake St., Denver 5, Colo.

NICHOLS ENGINEERING & RESEARCH CORP., 70 Pine St., N. Y. 5, N. Y.

SINTERING MACHINERY CORP., Netcong, N. J.

•**STEARNS MFG. CO.,** 600 E. Beecher St., Adrian, Mich.

UNITED IRON WORKS CO., 108 No. Locust, Pittsburg, Kans.

SKIP LOADERS

ANCHOR CONCRETE MACHINERY CO., 1191 Fairview Ave., Columbus 12, Ohio

THE C. O. BARTLETT AND SNOW CO., 6200 Harvard Ave., Cleveland 5, Ohio

BEAUMONT-BIRCH CO., 1503 Race St., Philadelphia, Penna.

•**BESSER MFG. CO.,** Alpena, Mich.

CONSTRUCTION PRODUCTS CORP., 410 San Fernando Road, Los Angeles 31, Calif.

DEMPSTER BROTHERS, INC., Springdale St., Knoxville 17, Tenn.

•**DES PLAINES CONCRETE MACHINERY CO.,** 930 North Ave., Des Plaines, Ill.

DODSON MFG. CO. INC., 1463 Barwise, Wichita 2, Kans.

HYSTER CO., 2918 N. E. Clackamas, Portland 8, Oregon

•**THE KENT MACHINE CO.,** 1931 Thomas St., Cuyahoga Falls, Ohio

LULL MFG. CO., 3612 E. 44th St., Minneapolis 6, Minn.

•**MULTIPLEX MACHINERY CORP.,** Elmore, Ohio

THE GENE OLSEN CORP., 401 Grace St., Adrian, Mich.

ROGERS IRON WORKS CO., Joplin, Mo.

•**STEARNS MFG. CO., INC.,** 600 E. Beecher St., Adrian, Mich.

WEBSTER MFG. INC., Tiffin 16, Ohio

WITTEMANN MACHINERY CO., Paynters Road, Farmingdale, N. J.

SKIP HOISTS

THE C. O. BARTLETT AND SNOW CO., 6200 Harvard Ave., Cleveland 5, Ohio

BEAUMONT-BIRCH CO., 1503 Race St., Philadelphia, Penna.

•**BESSER MFG. CO.,** Alpena, Mich.

THE BRADY CONVEYORS CORP., 20 W. Jackson Blvd., Chicago 4, Ill.

CLYDE IRON WORKS, INC., P. O. Box 370, Duluth 1, Minn.

•**COLUMBIA MACHINE WORKS,** 107 S. Grand Ave., Vancouver, Wash.

CONCRETE TRANSPORT MIXER CO., 4985 Fyler Ave., St. Louis 9, Mo.

DEMPSTER BROTHERS, INC., Springdale St., Knoxville 17, Tenn.

DODSON MFG. CO. INC., 1463 Barwise, Wichita 2, Kans.

•**FLEMING MFG. CO.,** 4985 Fyler Ave., St. Louis 9, Mo.

GAR-BRO MFG. CO., 2416 E. 16th St., Los Angeles 21, Calif.

GODFREY CONVEYOR CO., 13th & Wolf Ave., Elkhart, Ind.

GREENVILLE MFG. WORKS, Greenville, Ohio

ROBERT HOLMES & BROS., INC., 3519 Junction Ave., Danville, Ill.

HYSTER CO., 2918 N. E. Clackamas, Portland 8, Oregon

INGERSOLL-RAND CO., 11 Broadway, New York 4, N. Y.

THE JEFFREY MFG. CO., 935 N. 4th St., Columbus 16, Ohio

•**THE KENT MACHINE CO.,** 113 E. Portage Trail, Cuyahoga Falls, Ohio

MISHCO CORP., 615 SW 2nd Ave., Miami, Fla.

•**MULTIPLEX MACHINERY CORP.,** Elmore, Ohio

•**NORDBERG MFG. CO.,** 3073 S. Chase Ave., Milwaukee 7, Wis.

THE GENE OLSEN CORP., 401 Grace St., Adrian, Mich.

ROGERS IRON WORKS CO., 11th & Pearl Sts., Joplin, Mo.

•**STEARNS MFG. CO., INC.,** 600 E. Beecher St., Adrian, Mich.

STEARNS - ROGERS MFG. CO., 1720 California St., Denver 2, Colo.

STEPHENS-ADAMSON MFG. CO., 7 Ridgeway Ave., Aurora, Ill.

SUPERIOR - LIDGERWOOD - MUNDY CORP., 7 Dey St., New York 7, N. Y.

UNITED IRON WORKS CO., 108 No. Locust, Pittsburg, Kans.

UNIVERSAL TAMPERS INC., 1530 N. Adams St., Peoria 3, Ill.

WEBSTER MFG. INC., Tiffin 16, Ohio

THE WELLMAN ENGINEERING CO., 7000 Central Ave., Cleveland 5, Ohio

WITTEMANN MACHINERY CO., Paynters Rd., Farmingdale, N. J.

SLAKERS (see Hydrators, Lime)

SLINGS, Wire Rope (see Wire Rope Slings)

SLUGS, Grinding (see Grinding Media)

SLURRY AGITATORS

•**DENVER EQUIPMENT CO.,** 1410 Seventeenth St., Denver 17, Colo.

•**THE DORR CO., INC.,** Barry Place, Stamford, Conn.

THE GALIGHER COMPANY, 545 W. 8th South, Salt Lake City, Utah

•**HARDINGE CO., INC.,** 240 Arch St., York, Pa.

MANITOWOC ENGINEERING WORKS, Manitowoc, Wis.

MORSE BROS. MACHINERY CO., 2900 Brighton Blvd., Denver 1, Colo.

H. K. PORTER CO., INC., 49th & Harrison Sts., Pittsburgh 1, Pa.

•**W. A. RIDDELL CORP.,** Bucyrus, Ohio

•**F. L. SMIDTH & CO.,** 11 W. 42nd St., New York 18, N. Y.

•**THE T. L. SMITH CO.,** 2835 N. 32nd St., Milwaukee 45, Wis.

SPRAGUE & HENWOOD, INC., 221 W. Olive St., Scranton 2, Pa.

STRUTHERS WELLS CORP., Pennsylvania Ave., Warren, Pa.

•**WESTERN MACHINERY CO.,** 760-766 Folsom St., San Francisco 7, Calif.

SLURRY FILTERS

BIRD MACHINE CO., South Walpole, Mass.

•**DENVER EQUIPMENT CO.,** 1410 Seventeenth St., Denver 17, Colo.

THE EIMCO CORP., P. O. Box 300, Salt Lake City 10, Utah

FILTRATION ENGINEERS INC., 155 Oraton St., Newark 4, N. J.

MORSE BROS. MACHINERY CO., 2900 Brighton Blvd., Denver 1, Colo.

OLIVER UNITED FILTERS INC., 33 W. 42nd St., New York 18, N. Y.

SLURRY MIXERS

ABBE ENGINEERING CO., 50 Church St., New York 7, N. Y.

BETHLEHEM STEEL CO., 701 E. Third St., Bethlehem, Pa.

THE BONNOT CO., 722 Mulberry S.E., Canton 2, Ohio

•**THE DORR CO., INC.,** Barry Place, Stamford, Conn.

•**HARDINGE CO., INC.,** 240 Arch St., York, Pa.

THE PATTERSON FOUNDRY & MACHINE CO., 1250 St. George St., East Liverpool, Ohio

SEPARATION PROCESS CO., Fuller Bldg., Catasauqua, Pa.

STRUTHERS WELLS CORP., Pennsylvania Ave., Warren, Pa.

•**THE T. L. SMITH CO.,** 2835 N. 32nd St., Milwaukee 45, Wis.

SPRAGUE & HENWOOD, INC., 221 W. Olive St., Scranton 2, Pa.

SLURRY PUMPS (see Pumps, Slurry)

SLURRY SEPARATORS

MERCO CENTRIFUGAL CO., 1045 Sansone St., San Francisco 11, Calif.

NICHOLS ENGINEERING & RESEARCH CORP., 70 Pine St., New York 5, N. Y.

SEPARATION PROCESS CO., Fuller Bldg., Catasauqua, Pa.

•**F. L. SMIDTH & CO.,** 11 W. 42nd St., New York 18, N. Y.

SLURRY THICKENERS

BIRD MACHINE CO., South Walpole, Mass.

CENTRIFUGE MECHANICAL EQPT., INC., 95 River St., Hoboken, N. J.

THE CONVEYOR CO., 3260 East Slauson Ave., Los Angeles 11, Calif.

•**DENVER EQUIPMENT CO.,** 1410 Seventeenth St., Denver 17, Colo.

•**THE DORR CO., INC.,** Barry Place, Stamford, Conn.

•**EAGLE IRON WORKS,** 137 Holcomb Ave., Des Moines 4, Iowa

GENERAL AMERICAN TRANSPORTATION CORP., Field Bldg. Room 3105, 135 So. LaSalle St., Chicago 90, Ill.

•**HARDINGE CO., INC.,** 240 Arch St., York, Pa.

•**LINK-BELT CO.,** 300 W. Pershing Road, Chicago 9, Ill.

MERCO CENTRIFUGAL CO., 1045 Sansone St., San Francisco 11, Calif.

MORSE BROS. MACHINERY CO., 2900 Brighton Blvd., Denver 1, Colo.

ROGERS IRON WORKS CO., 11th & Pearl Sts., Joplin, Mo.

•**WESTERN MACHINERY CO.,** 760-766 Folsom St., San Francisco 7, Calif.

SOCKETS, Wire Rope (see Wire Rope Fittings)

SPACE HEATERS

•**GENERAL ELECTRIC CO.,** 1 River Road, Schenectady 5, N. Y.

SPEED REDUCERS (see Drives)

SPOUTS (see Chutes)

SPRAY COOLING SYSTEMS

THE DEISTER CONCENTRATOR CO., 935 Glascow Ave., Fort Wayne 1, Ind.

•**F. L. SMIDTH & CO.,** 11 W. 42nd St., New York 18, N. Y.

SPRAYS, Wash Water

SPROCKETS, Chain

THE C. O. BARTLETT AND SNOW CO., 6200 Harvard Ave., Cleveland 5, Ohio

BEAUMONT BIRCH CO., Philadelphia 2, Pa.

•**CHAIN BELT CO.,** 1600 W. Bruce St., Milwaukee 4, Wis.

CHICAGO STEEL FOUNDRY COMPANY, 3720 So. Kedzie Ave., Chicago 32, Ill.

THE CONVEYOR CO., 3260 East Slauson Ave., Los Angeles 11, Calif.

DIAMOND CHAIN CO., INC., 402 Kentucky Ave., Indianapolis 7, Ind.

•**THE FROG, SWITCH & MFG. CO.,** Carlisle, Pa.

•**IOWA MFG. CO.,** 916 16th St. N.E., Cedar Rapids, Iowa

THE JEFFREY MFG. CO., 935 N. 4th St., Columbus 16, Ohio

KENSINGTON STEEL CO., 505 Kensington St., Chicago 28, Ill.

•**LINK-BELT CO.,** 300 W. Pershing Road, Chicago 9, Ill.

MORSE CHAIN CO., 7601 Central Ave., Detroit 8, Mich.

STRON PROCESS STEEL CO., 1428 High St., Pittsburgh 12, Pa.

• A dot before name indicates advertiser in this issue. See advertiser index.

DIRECTORY

●**TAYLOR-WHARTON IRON & STEEL CO.**, High Bridge, N. J.
UNITED IRON WORKS CO., 108 No. Locust, Pittsburg, Kans.
WEBSTER MFG. INC., Tiffin 16, Ohio
●**YUBA MFG. CO.**, 351 California St., San Francisco 4, Calif.

STAIR TREADS & STEPS, Industrial

●**BOSTON WOVEN HOSE & RUBBER CO.**, P.O. Box 1071, Boston 3, Mass.
GOODALL RUBBER CO., Whitehead Road, Trenton 4, N. J.
●**HENDRICK MFG. CO.**, Carbondale, Pa.
LUKENS STEEL CO., 521 Lukens Bldg., Coatesville, Pa.
●**JOS T. RYERSON & SON, INC.**, 2558 W. 16th Street, Chicago 80, Ill.
UNITED STATES RUBBER CO., 1230 Ave. of the Americas, New York 20, N. Y.

STARTERS, Motor

●**ALLIS-CHALMERS MFG. CO.**, 975 So. 70th St., Milwaukee 1, Wis.
B. F. M. INDUSTRIES, INC., 2124 Mill Ave., Brooklyn 34, N. Y.
THE ELECTRIC CONTROLLER & MFG. CO., 2700 E. 79th St., Cleveland 4, Ohio
FREDERICK IRON & STEEL CO., Frederick, Ind.
●**GENERAL ELECTRIC CO.**, 1 River Road, Schenectady 5, N. Y.
GREENVILLE MFG. WORKS, 112½ W. Fourth St., Greenville, Ohio
WESTINGHOUSE ELECTRIC CO., First Nat'l Bank Bldg., Pittsburgh, Pa.

STEAM-CURING EQUIPMENT, Concrete (see Kilns)

STEEL

1. Abrasion Resisting
2. Bar
3. Concrete Reinforcing
4. Heat-Resisting
5. Manganese
6. Plates & Shapes
7. Shafting
8. Special Alloy

ALLIED STEEL PRODUCTS, INC., 7835 Broadway, Cleveland 5, Ohio
1—2—5—6—7—8
●**AMERICAN MANGANESE STEEL DIV. OF AMERICAN BRAKE SHOE CO.**, 377 E. 14th St., Chicago Heights, Ill.
1—4—5—8
AMERICAN STEEL & WIRE CO., Rockefeller Bldg., Cleveland 13, Ohio
3
AUTOMATIC SPRING COILING CO., 4051 W. Thorndale Ave., Chicago, Ill.
3
BETHLEHEM STEEL CO., 701 E. Third St., Bethlehem, Pa.
1—2—3—4—5—6—7—8
●**CAPE ANN ANCHOR & FORGE CO.**, Whittemore St., Gloucester, Mass.
7
CHICAGO STEEL FOUNDRY CO., 3720 So. Kedzie Ave., Chicago 32, Ill.
1—4—8
●**THE COLORADO FUEL & IRON CORP.**, P. O. Box 1920, Denver 1, Colo.
2—3—6
ELECTRIC STEEL FOUNDRY CO., 2141 N. W. 25th Ave., Portland 10, Ore.
1—4—5—8
ELECTRO-ALLOYS DIV., AMERICAN BRAKE SHOE CO., Taylor St. & Abbey Road, Elyria, Ohio
4
THE FAHRALLOY CO., 149th Loomis St., Harvey, Ill.
4—8
FARRELL-CHEEK STEEL CO., Sandusky, Ohio
1
●**THE FROG, SWITCH & MFG. CO.**, Carlisle, Pa.
1—5
GREENVILLE MFG. WORKS, 112½ W. Fourth St., Greenville, Ohio
1—2—3—5—6—7—8
INLAND STEEL COMPANY, 38 So. Dearborn St., Chicago 3, Ill.
1—2—3—6
ISAACSON IRON WORKS, Box 3028, Seattle 14, Wash.
1—2—3—4—5—6—7—8
JONES & LAUGHLIN STEEL CORP., Third Ave. & Ross St., Pittsburgh 30, Pa.
1—2—3—6—7—8
KENSINGTON STEEL CO., 505 Kensington St., Chicago 28, Ill.
8
LACLEDE STEEL CO., Arcade Bldg., St. Louis 1, Mo.
2—3
LUKENS STEEL CO., 521 Lukens Bldg., Coatesville, Pa.
1—4—5—6—8
MANGANESE STEEL FORGE CO., Richmond St. & Castor Ave., Philadelphia 34, Pa.
1—5—8
REPUBLIC STEEL CORP., Republic Bldg., Cleveland 1, Ohio
1—2—3—4—5—6—7—8
●**JOSEPH T. RYERSON & SON, INC.**, 2558 West 16th St., Chicago 80, Ill.
1—2—3—4—5—6—7—8
STROH PROCESS STEEL CO., 1428 High St., Pittsburgh 12, Pa.
1
STULZ-SICKLES CO., 134 Lafayette St., Newark 5, N. J.
5—6
STURTEVANT MILL CO., 102 Clayton St., Boston 22, Mass.
5—6
●**TAYLOR-WHARTON IRON & STEEL CO.**, High Bridge, N. J.
1—5
●**THE TIMKEN ROLLER BEARING CO.**, 1835 Dueber Ave. S.W., Canton 6, Ohio
2—8
TRUSCON STEEL CO., Albert St., Youngstown 1, Ohio
3
UNITED STATES STEEL CO., 525 William Penn Place, Pittsburgh 30, Pa.
1—2—3—4—5—6—7—8

STOKERS, Coal, for Lime Kilns, Etc.

ARNOLD & WEIGEL DIV., TOLEDO ENGINEERING CO., INC., 958 Wall St., Toledo 6, Ohio
●**THE BABCOCK & WILCOX CO.**, 85 Liberty St., New York 6, N. Y.
WM. BROS. BOILER & MFG. CO., 1057 10th Ave. S.E., Minneapolis 14, Wis.
FAIRBANKS, MORSE & CO., 600 S. Michigan Ave., Chicago 5, Ill.

STORAGE SYSTEMS, Radial

BARBER-GREENE, 631 Park Ave., Aurora, Ill.
●**ROBINS CONVEYORS DIV., HEWITT-ROBINS INC.**, 270 Passaic Ave., Passaic, N. J.
THE MARIETTA CONCRETE CORP., Westview, Box 356, Marietta, Ohio
THE NEFF & FRY CO., 150 S. Main St., Camden, Ohio
●**PETTIBONE-MULLIKEN CORP., IMPACT MASTER DIVISION**, 4700 W. Division St., Chicago 51, Ill.
STEPHENS-ADAMSON MFG. CO., 7 Ridgeway Ave., Aurora, Ill.

STUCCO COLORS (see Cement and Masonry Colors)

SUPERHEATERS (see Boilers)

SWITCHBOARDS AND PANELS

●**ALLIS-CHALMERS MFG. CO.**, 975 So. 70th St., Milwaukee 1, Wis.
ALBERT & J. M. ANDERSON MFG. CO., 289-305 A St., Boston 10, Mass.
CONSOLIDATED DIESEL ELEC. CORP., Ludlow and Canal Sts., Stamford, Conn.
ELECTRIC MACHINERY MFG. CO., 1331 Tyler St. N.E., Minneapolis 14, Minn.
●**GENERAL ELECTRIC CO.**, 1 River Road, Schenectady 5, N. Y.
GREENVILLE MFG. WORKS, 112½ W. Fourth St., Greenville, Ohio
I-T-E CIRCUIT BREAKER CO., 19th and Hamilton St., Philadelphia 30, Pa.
INTERNATIONAL DIESEL ELECTRIC CO., INC., 13-02 44th Ave., Long Island City 1, N. Y.
WESTINGHOUSE ELECTRIC CO., First Nat'l Bank Bldg., Pittsburgh, Pa.

SWITCHES, Control, Electric

●**ALLIS-CHALMERS MFG. CO.**, 975 So. 70th St., Milwaukee 1, Wis.
ALBERT & J. M. ANDERSON MFG. CO., 289-305 A St., Boston 10, Mass.
B. F. M. INDUSTRIES, INC., 2124 Mill Ave., Brooklyn 34, N. Y.
●**GENERAL ELECTRIC CO.**, 1 River Road, Schenectady 5, N. Y.
GREENVILLE MFG. WORKS, 112½ W. Fourth St., Greenville, Ohio
I-T-E CIRCUIT BREAKER CO., 19th and Hamilton St., Philadelphia 30, Pa.
MINNEAPOLIS - HONEYWELL REGULATOR CO., BROWN INSTRUMENTS DIV., Wayne & Windrim Aves., Philadelphia 44, Pa.
WESTINGHOUSE ELECTRIC CO., First Nat'l Bank Bldg., Pittsburgh, Pa.

SWITCHES, Magnetic

●**ALLIS-CHALMERS MFG. CO.**, 975 So. 70th Street, Milwaukee 1, Wis.
B. F. M. INDUSTRIES, INC., 2124 Mill Ave., Brooklyn 34, N. Y.
●**GENERAL ELECTRIC CO.**, 1 River Road, Schenectady 5, N. Y.
GREENVILLE MFG. WORKS, 112½ W. Fourth St., Greenville, Ohio
STEARNS MAGNETIC MFG. CO., 675 S. 28th St., Milwaukee 46, Wis.
WESTINGHOUSE ELECTRIC CO., First Nat'l Bank Bldg., Pittsburgh, Pa.
WITTEMANN MACHINERY CO., Paynters Rd., Farmingdale, N. J.

T

TABLES, Washing, Concentrating (see Concentrating Tables)

TACHOMETERS, Counters, Etc.

THE BRISTOL CO., Waterbury 20, Conn.
●**GENERAL ELECTRIC CO.**, 1 River Road, Schenectady 5, N. Y.
MANNING, MAXWELL & MOORE, INC., 250 E. Main St., Stratford, Conn.
MINNEAPOLIS - HONEYWELL REGULATOR CO., BROWN INSTRUMENTS DIV., Wayne & Roberts Aves., Philadelphia 44, Pa.
MONTGOMERY & CO., INC., 53 Park Pl., New York 7, N. Y.
RELIANCE ELECTRIC & ENGINEERING CO., 1088 Ivanhoe Rd., Cleveland 10, Ohio
WESTINGHOUSE ELECTRIC CO., First Nat'l Bank Bldg., Pittsburgh, Pa.

TANKS, Gasoline

BIRMINGHAM TANK CO., DIV. OF INGALLS IRON WKS. CO., P. O. Drawer 1490, Birmingham 1, Ala.
BUFFALO GASOLINE ENGINE SERVICE, 175 Great Arrow Ave., Buffalo 7, N. Y.
GENERAL AMERICAN TRANSPORTATION CORP., Field Bldg. Room 3105, 135 So. LaSalle St., Chicago 90, Ill.
GRAVER TANK & MFG. CO., INC., 4809 Tod Ave., East Chicago, Ind.
THE HEIL CO., 3000 W. Montana St., Milwaukee 1, Wis.
THE INGALLS IRON WORKS CO., P.O. Drawer 2632, Birmingham 2, Ala.
LANDIS STEEL CO., 116 West A St., P.O. Box 248, Picher, Okla.
PRESSED STEEL CAR CO., INC., 25 Broad St., New York 4, N. Y.
SOUTHWEST WELDING & MFG. CO., 3201 W. Mission Road, Alhambra, Calif.

TANKS, Sand Settling (see Sand Recovery Machinery)

TANKS, Storage, Concrete

CONCRETE FORMS CORP., 20 Vesey St., New York 7, N. Y.
THE CONVEYOR CO., 3260 East Slauson Ave., Los Angeles 11, Calif.
GAR-BRO MFG. CO., 2416 E. 16th St., Los Angeles 21, Calif.
GREENVILLE MFG. WORKS, 112½ W. Fourth St., Greenville, Ohio
THE KIRK & BLUM MFG. CO., 2838 Spring Grove Ave., Cincinnati 25, Ohio
●**LIPPMANN ENGINEERING WORKS**, 4603 W. Mitchell St., Milwaukee 14, Wis.
THE MARIETTA CONCRETE CORP., Westview, Box 356, Marietta, Ohio

● A dot before name indicates advertiser in this issue. See advertiser index.

DIRECTORY

PRESSED STEEL CAR CO., INC., 25 Broad Street, New York 4, N. Y.

THE NEFF & FRY CO., 150 S. Main St., Camden, Ohio

TANKS, Storage, Steel

ALLIED WELDING & MFG. CO., INC., 49 Lorna Doone Blvd., Orlando, Fla.

ARNOLD & WEIGEL DIV., TOLEDO ENGINEERING CO., INC., 958 Wall St., Toledo 6, Ohio

ALPHA TANK & SHEET METAL MFG. CO., 5001 S. 38th Street, St. Louis 16, Mo.

BETHLEHEM STEEL CO., 701 E. Third St., Bethlehem, Pa.

BIRMINGHAM TANK CO., DIV. OF INGALLS IRON WKS. CO., P. O. Drawer 1490, Birmingham 1, Ala.

•**BUTLER BIN CO.,** Box 407, Waukesha, Wis.

CONCRETE FORMS CORP., 20 Vesey St., New York 7, N. Y.

CONCRETE TRANSPORT MIXER CO., 4985 Fyler Ave., St. Louis 9, Mo.

THE CONVEYOR CO., 3260 East Slauson Ave., Los Angeles 11, Calif.

•**DIAMOND IRON WORKS, INC.,** 1728 North 2nd Street, Minneapolis 11, Minn.

•**FLEMING MFG. CO.,** 4985 Fyler St. Louis, Mo.

GENERAL AMERICAN TRANSPORTATION CORP., Field Bldg. Room 3105, 135 So. LaSalle St., Chicago 90, Ill.

GRAVER TANK & MFG. CO., INC., 4809 Tod Ave., East Chicago, Ind.

GREENVILLE MFG. WORKS, 112½ W. Fourth St., Greenville, Ohio

THE HELTZEL STEEL FORM AND IRON CO., 1750 Thomas Road, Warren, Ohio

THE INGALLS IRON WORKS CO., P.O. Drawer 2632, Birmingham 2, Ala.

IRVINGTON FORM & TANK CORP., 20 Vesey St., New York 7, N. Y.

LANDIS STEEL CO., 116 W. A St., Picher, Okla.

•**LIPPMANN ENGINEERING WORKS,** 4603 W. Mitchell St., Milwaukee 14, Wis.

THE PATTERSON FOUNDRY & MACHINE CO., 1250 St. George St., East Liverpool, Ohio

PRESSED STEEL CAR CO., INC., 25 Broad St., New York 4, N. Y.

SIMPLICITY SYSTEM CO., Riverside Dr., Chattanooga 6, Tenn.

SOUTHWEST WELDING & MFG. CO., 3201 W. Mission Road, Alhambra, Calif.

UNITED IRON WORKS CO., 108 No. Locust, Pittsburg, Kans.

WM. BROS. BOILER & MFG. CO., 1057 10th Ave. S.E., Minneapolis 14, Minn.

WIS. FOUNDRY & MACHINE CO., 623 E. Main St., Madison, Wis.

TESTING LABORATORIES (see Laboratories)

TESTING EQUIPMENT (see Laboratory Apparatus)

THAWING PITS *(For Frozen R. R. Hopper Cars)*

•**HAUCK MFG. CO.,** 124-136 Tenth St., Brooklyn 15, N. Y.

JOHNSTON MFG. CO., 2825 E. Hennepin Ave., Minneapolis 13, Minn.

THERMOCOUPLES, Pyrometers (see Pyrometers)

THICKENERS (see Slurry Thickeners)

THIRD AXLES (see Motor Truck Drives & Differentials)

TIRES, Coolers, Dryers, Kiln

GREENVILLE MFG. WORKS, 112½ W. Fourth St., Greenville, Ohio

JAMES C. HEINTZ & CO., INC., W. 143rd at Lorain Ave., Cleveland 11, Ohio

LUKENS STEEL CO., 521 Lukens Bldg., Coatesville, Pa.

•**F. L. SMIDTH & CO.,** 11 W. 42nd St., New York 18, N. Y.

STROH PROCESS STEEL CO., 1428 High St., Pittsburgh 12, Pa.

•**TRAYLOR ENGINEERING & MFG. CO.,** Allentown, Pa.

UNITED IRON WORKS CO., 108 No. Locust, Pittsburg, Kans.

TIRES AND TUBES, Rubber, Heavy Duty Industrial

THE DAYTON RUBBER CO., Dayton 1, Ohio

•**THE FIRESTONE TIRE & RUBBER CO.,** 1200 Firestone Pkway, Akron 17, Ohio

THE GATES RUBBER CO., 999 S. Broadway, Denver 17, Colo.

THE GENERAL TIRE & RUBBER CO., 1708 Englewood Ave., Akron 9, Ohio

•**THE GOODYEAR TIRE AND RUBBER CO., INC.,** 1144 E. Market St., Akron 16, Ohio

SEIBERLING RUBBER CO., Akron 9, Ohio

UNITED STATES RUBBER CO., 1230 Ave. of the Americas, New York 20, N. Y.

TORCHES, Cutting and Welding (see Welding & Cutting Equipment, Oxyacetylene)

TOWERS, Structural Steel

BETHLEHEM STEEL CO., 701 E. Third St., Bethlehem, Pa.

BIRMINGHAM TANK CO., DIV. OF INGALLS IRON WORKS CO., P.O. Drawer 1490, Birmingham, 1, Ala.

THE INGALLS IRON WORKS CO., 620 Ave. D, Birmingham 2, Ala.

LANDIS STEEL CO., 116 West A St., P.O. Box 248, Picher, Okla.

MECKUM ENGINEERING, INC., Dayton Rd., Ottawa, Ill.

MIXERMOBILE MANUFACTURERS, 6855 N. E. Halsey St., P. O. Box 5108, Portland 16, Ore.

McNALLY-PITTSBURG MFG. CORP., Pittsburg, Kans.

TRACK & TRACK EQUIPMENT

ALLIED STEEL PRODUCTS, INC., 7835 Broadway, Cleveland 5, Ohio

ATHEY PRODUCTS CORP., 5631 W. 65th St., Chicago 43, Ill.

BETHLEHEM STEEL CO., 701 E. Third St., Bethlehem, Pa.

BIRMINGHAM RAIL & LOCOMOTIVE CO., P.O. Box 391, Birmingham 1, Ala.

THE BUDA COMPANY, 154th & Commercial, Harvey, Ill.

THE C. S. CARD IRON WORKS CO., P.O. Box 117, Denver 1, Colo.

CHICAGO STEEL FOUNDRY COMPANY, 3720 So. Kedzie Ave., Chicago 32, Ill.

•**THE COLORADO FUEL & IRON CORP.,** Continental Oil Bldg., Denver 2, Colo.

EASTON CAR & CONSTRUCTION CO., Easton Pa.

L. B. FOSTER CO., P. O. Box 1647, Pittsburgh 30, Pa.

MIDWEST STEEL CORP., Charleston 2, W. Va.

PRESSED STEEL CAR CO., INC., 25 Broad St., New York 4, N. Y.

•**TAYLOR-WHARTON IRON & STEEL CO.,** High Bridge, N. J.

UNITED STATES STEEL CO., Pittsburgh 30, Pa.

TRACTORS, Industrial Crawler

•**ALLIS-CHALMERS MFG. CO.,** 975 So. 70th St., Milwaukee 1, Wis.

•**ALLIS-CHALMERS MFG. CO., TRACTOR DIVISION,** P. O. Box 512, Milwaukee 1, Wis.

J. I. CASE CO., 700 State St., Racine, Wis.

•**CATERPILLAR TRACTOR CO.,** Peoria 8, Ill.

HENNEUSE ENGINEERING CO., Marion, Ohio

INTERNATIONAL HARVESTER CO., 180 N. Michigan Ave., Chicago 1, Ill.

LEWIS-SHEPARD PRODUCTS INC., 206 Walnut St., Watertown 72, Mass.

LULL MFG. CO., 3612 E. 44th St., Minneapolis 6, Minn.

M-R-S MANUFACTURING CO., P. O. Box 336, Flora, Miss.

THE OLIVER CORP., INDUSTRIAL DIV., 19300 Euclid Ave., Cleveland 17, Ohio

SILENT HOIST & CRANE CO., 841 63rd St., Brooklyn 20, N. Y.

TRAILER BODIES (see Bodies)

TRAILER BODIES, Bulk Cement (see Bodies)

TRAILERS & SEMI-TRAILERS, Motor Truck

ATHEY PRODUCTS CO., 5631 W. 65th St., Chicago 38, Ill.

•**COOK BROS. EQUIPMENT CO.,** 1815 N. Broadway, Los Angeles 31, Calif

DART TRUCK CO., Oak at 27th Sts., Kansas City 8, Mo.

•**THE EUCLID ROAD MACHNRY. CO.,** 1361 Chardon Road, Cleveland 17, Ohio

FORD MOTOR CO., Administration Bldg., Dearborn, Mich.

FRUEHAUF TRAILER CO., Detroit 32, Mich.

THE HANSON CLUTCH & MACHINERY CO., Wall & Miami Sts., Tiffin 15, Ohio

LANDIS STEEL CO., 116 West A St., P.O. Box 248, Picher, Okla.

M-R-S MANUFACTURING CO., P. O. Box 336, Flora, Miss.

PRESSED STEEL CAR CO., INC., 25 Broad Street, New York 4, N. Y.

THE TRAILMOBILE CO., 31st and Robertson Aves., Cincinnati 19, Ohio

TRUCK ENGINEERING CORP., 1285 W. 70th St., Cleveland 2, Ohio

UNITED IRON WORKS CO., 108 No. Locust, Pittsburg, Kans.

WINCH-LIFT INC., 317 First National Bank, Shreveport, La.

TRAMWAYS, Aerial (see Aerial Tramways)

TRANSFER PLANTS, Ready-Mixed Concrete

BLAW-KNOX DIV. OF BLAW-KNOX CO., P.O. Box 1198, Pittsburgh 30, Pa.

CONCRETE TRANSPORT MIXER CO., 4985 Fyler Ave., St. Louis 9, Mo.

THE HELTZEL STEEL FORM & IRON CO., 1750 Thomas Rd., Warren, Ohio

•**THE C. S. JOHNSON CO.,** P.O. Box 71, Champaign, Ill.

TRANSFORMERS, Electric

•**ALLIS-CHALMERS MFG. CO.,** 975 So. 70th St., Milwaukee 1, Wis.

•**GENERAL ELECTRIC CO.,** 1 River Road, Schenectady 5, N. Y.

GREENVILLE MFG. WORKS, 112½ W. Fourth St., Greenville, Ohio

I-T-E CIRCUIT BREAKER CO., 19th and Hamilton St., Philadelphia 30, Pa.

WAGNER ELECTRIC CORP., 6400 Plymouth Ave., St. Louis 14, Mo.

WESTINGHOUSE ELECTRIC CO., First Nat'l Bank Bldg., Pittsburgh, Pa.

TRANSIT CONCRETE MIXING PLANTS (see Central Mixing Plants)

TRANSMISSION MACHINERY (see Gears)

TRIPPERS, Belt (see Conveyor Belt Trippers)

TROLLEYS, I-Beam

CHISHOLM-MOORE HOIST CORP., Fremont Ave., Tonawanda, N. Y.

CONCRETE TRANSPORT MIXER CO., 4985 Fyler Ave., St. Louis, Mo.

•**THE COLORADO FUEL & IRON CORP.,** Continental Oil Bldg., Denver 2, Colo.

•**FLEMING MFG. CO.,** 4985 Fyler Ave., St. Louis 9, Mo.

GODFREY CONVEYOR CO., 13th & Wolf Ave., Elkhart, Ind.

GREENVILLE MFG. WORKS, 112½ W. Fourth St., Greenville, Ohio

WHITING CORP., 15693 Lathrop Ave., Harvey, Ill.

THE YALE & TOWNE MFG. CO., Philadelphia 15, Pa.

TRUCK BODIES (see Bodies)

TRUCKS, Dump (see Motor Trucks)

TRUCKS, Hand

THE AMERICAN PULLEY CO., 4200 Wissahickon Ave., Philadelphia 29, Penna.

BARRET-CRAVENS CO., 4613 S. Western Blvd., Chicago 9, Ill.

• A dot before name indicates advertiser in this issue. See advertiser index.

DIRECTORY

THE CHASE FOUNDRY & MFG. CO., 2300 S. Parsons Ave., Columbus 7, Ohio

EASTON CAR & CONSTRUCTION CO., Easton, Pa.

THE HOWE SCALE CO., Rutland, Vt.

LEWIS-SHEPARD PRODUCTS INC., 206 Walnut St., Watertown 72, Mass.

LIFT TRUCKS, INC., 2425 Spring Grove Ave., Cincinnati 14, Ohio

REVOLVATOR CO., 86th St. at U. S. Rts. 1 and 9, North Bergen, N. J.

SERVICE CASTER & TRUCK CORP., 500 N. Brownswood Ave., Albion, Mich.

TRUCKS, Lift (see Lift Trucks)

TRUCKS, Straddle

GERLINGER CARRIER CO., Dallas, Oregon

TRUCKS & TRACTORS, Wheeled Industrial

1. Electric
2. Gas

•**ALLIS - CHALMERS MFG. CO., TRACTOR DIVN.,** P.O. Box 512, Milwaukee 1, Wis.
1—2

AUTOMATIC TRANSPORTATION CO., 101 W. 87th St., Chicago 20, Ill.
1

BAKER INDUSTRIAL TRUCK DIV., THE BAKER-RAULANG Co., 1250 W. 80th St., Cleveland 2, Ohio
1

BARRET-CRAVENS CO., 4613 S. Western Blvd., Chicago 9, Ill.
1

THE BUDA COMPANY, 154th & Commercial, Harvey, Ill.
2

CLARK EQUIPMENT CO., INDUSTRIAL TRUCK DIV., Springfield Pl., Battle Creek, Mich.
1—2

DROTT MANUFACTURING CORP., 3841 W. Wisconsin Ave., Milwaukee 8, Wis.
2

EASTON CAR & CONSTRUCTION CO., Easton, Pa.
1

THE ELWELL-PARKER ELEC. CO., 4205 St. Clair Ave., Cleveland 8, Ohio
1—2

GAR-BRO MFG. CO., 2416 E. 16th St., Los Angeles 21, Calif.
2

HYSTER CO., 2902 N. E. Clackamas, Portland 8, Ore.
2

•**THE KNICKERBOCKER CO.,** 603 Liberty St., Jackson, Mich.
2

LEWIS-SHEPARD PRODUCTS INC., 206 Walnut St., Watertown 72, Mass.
1—2

LIFT TRUCKS, INC., 2425 Spring Grove Ave., Cincinnati 14, Ohio
1

LULL MFG. CO., 3612 E. 44th St., Minneapolis 6, Minn.
2

MINNEAPOLIS-MOLINE CO., P. O. Box 1050, Minneapolis 1, Minn.
2

THE OLIVER CORP., INDUSTRIAL DIV., 19300 Euclid Ave., Cleveland 17, Ohio
2

THE PRIME-MOVER CO., Muscatine, Iowa
2

REVOLVATOR CO., 86th St. at U. S. Rts. 1 and 9, North Bergen, N. J.
1

SERVICE CASTER & TRUCK CORP., 500 N. Brownswood Ave., Albion, Mich.
1—2

SHEPPARD DIESELS, Philadelphia St., Hanover, Pa.
2

SILENT HOIST & CRANE CO., 841 63rd St., Brooklyn 20, N. Y.
2

THE YALE & TOWNE MFG. CO., Philadelphia 15, Pa.
1—2

TRUCKS, Motor (see Motor Trucks)

TURBINES, Steam

•**ALLIS-CHALMERS MFG. CO.,** 975 So. 70th St., Milwaukee 1, Wis.

BETHLEHEM STEEL CO., 701 E. Third St., Bethlehem, Pa.

COPPUS ENGINEERING CORP., 344 Park Ave., Worcester 2, Mass.

DE LAVAL STEAM TURBINE CO., Trenton 2, N. J.

•**GENERAL ELECTRIC CO.,** 1 River Road, Schenectady 5, N. Y.

C. W. KALBFUS, Elliott Co., Inc., Jeanette, Pa.

WESTINGHOUSE ELECTRIC CO., First Nat'l Bank Bldg., Pittsburgh, Pa.

WORTHINGTON PUMP & MACHINERY CORP., Worthington Ave., Harrison, N. J.

TURBINES, Water

•**ALLIS-CHALMERS MFG. CO.,** 975 So. 70th St., Milwaukee 1, Wis.

THE BALDWIN LOCOMOTIVE WORKS, Philadelphia 42, Pa.

DE LAVAL STEAM TURBINE CO., Trenton 2, N. J.

TURNTABLES, Track

THE ATLAS CAR & MFG. CO., 1140 Ivanhoe Rd., Cleveland 10, Ohio

BETHLEHEM STEEL CO., 701 E. Third St., Bethlehem, Pa.

EASTON CAR & CONSTRUCTION CO., Easton, Pa.

•**HARDINGE CO., INC.,** 240 Arch St., York, Pa.

THE GENE OLSON CORP., 401 Grace St., Adrian, Mich.

PRESSED STEEL CAR CO., INC., 25 Broad St., New York 4, N. Y.

REVOLVATOR CO., 86th St. at U. S. Rts. 1 and 9, North Bergen, N. J.

STEPHENS-ADAMSON MFG. CO., 7 Ridgeway Ave., Aurora, Ill.

UNITED IRON WORKS CO., 108 No. Locust, Pittsburg, Kans.

WHITING CORP., 15693 Lathrop Ave., Harvey, Ill.

U

UNLOADERS, Boat

BEAUMONT-BIRCH CO., 1512 Race St., Philadelphia 2, Pa.

CLYDE IRON WORKS, P.O. Box 370, Duluth 1, Minn.

THE EIMCO CORP., P.O. Box 300, Salt Lake City 10, Utah

GEORGE HAISS MFG. CO., Park Ave. & 143rd St., New York 51, N. Y.

•**ROBINS CONVEYORS DIV., HEWITT-ROBINS INC.,** 270 Passaic Ave., Passaic, N. J.

THE FRANK G. HOUGH CO., Sunnyside Ave., Libertyville, Ill.

•**LIPPMANN ENGINEERING WORKS,** 4603 W. Mitchell St., Milwaukee 14, Wis.

LULL MFG. CO., 3612 E. 44th St., Minneapolis 6, Minn.

McKIERNAN-TERRY CORP., 505 Manor Ave., Harrison, N. J.

SILENT HOIST & CRANE CO., 879 63rd St., Brooklyn 20, N. Y.

STEPHENS-ADAMSON MFG. CO., 7 Ridgeway Ave., Aurora, Ill.

TRACKSON COMPANY, 3333 S. Chase Ave., Milwaukee 7, Wis.

THE WELLMAN ENGINEERING CO., 7000 Central Ave., Cleveland 5, Ohio

UNLOADERS, Box Car

•**BARBER-GREENE CO.,** 631 W. Park Ave., Aurora, Ill.
2

•**BAUGHMAN MFG. CO., INC.,** 1000 Shipman Road, Jerseyville, Ill.

BONDED SCALE & MACHINE CO., 41 Bellview Ave., Columbus 7, Ohio

•**BUTLER BIN CO.,** Box 407, Waukesha, Wis.

THE CONVEYOR CO., 3260 East Slauson Ave., Los Angeles 11, Calif.

THE EIMCO CORP., P. O. Box 300, Salt Lake City 10, Utah

GEORGE HAISS MFG. CO., Park Ave. & 143rd St., New York 51, N. Y.

THE HELTZEL STEEL FORM AND IRON CO., 1750 Thomas Road, Warren, Ohio

•**THE FRANK G. HOUGH CO.,** Sunnyside Ave., Libertyville, Ill.

HYSTER CO., 2918 N.E. Clackamas, Portland 8, Ore.

THE JEFFREY MFG. CO., 935 N. 4th St., Columbus 16, Ohio

•**THE C. S. JOHNSON CO.,** P.O. Box 71, Champaign, Ill.

MANDT MFG. CO., 490 W. Goodale St., Columbus 8, Ohio

•**LIPPMANN ENGINEERING WORKS,** 4603 W. Mitchell St., Milwaukee 14, Wis.

LULL MFG. CO., 3612 E. 44th St., Minneapolis 6, Minn.

•**PETTIBONE MULLIKEN CORP.,** 4710 W. Division St., Chicago 51, Ill.

RICHARDSON SCALE CO., Van Houten Ave., Clifton, N. J.

SILENT HOIST & CRANE CO., 879 63rd St., Brooklyn 20, N. Y.

SPROUT, WALDRON & CO., INC., Muncy, Pa.

STEPHENS-ADAMSON MFG. CO., 7 Ridgeway Ave., Aurora, Ill.

TRACTOMOTIVE CORP., County Line Road, Deerfield, Ill.

WEBSTER MFG. INC., Tiffin 16, Ohio

UNLOADERS, Pneumatic

BEAUMONT BIRCH CO., 1512 Race Street, Philadelphia 2, Pa.

BLOWER APPLICATION CO., 3165 N. 30th St., Milwaukee 10, Wis.

•**FULLER COMPANY,** Fuller Bldg., Catasauqua, Pa.

LULL MFG. CO., 3612 E. 44th St., Minneapolis 6, Minn.

UNLOADERS, Hopper Car

ALLIS-CHALMERS MFG. CO., 975 S. 70th St., Milwaukee 1, Wis.

•**BARBER-GREENE CO.,** 631 W. Park Ave., Aurora, Ill.

•**BAUGHMAN MFG. CO., INC.,** Jerseyville, Ill.

THE BURCH CORP., Crestline, Ohio

•**CONTINENTAL GIN CO.,** 4500 5th Ave. S., Birmingham, Ala.

•**A. B. FARQUHAR CO.,** 142 N. Duke, Dept. 28, York, Pa.

•**FLEMING MFG CO.,** 4985 Fyler Ave., St. Louis, Mo.

GODFREY CONVEYOR CO., 13th & Wolf Ave., Elkhart, Ind.

GEORGE HAISS MFG. CO., INC., Park Ave. and 143rd St., New York 51, N. Y.

THE HELTZEL STEEL FORM & IRON CO., 1750 Thomas Rd., Warren, Ohio

•**ROBINS CONVEYORS DIV., HEWITT-ROBINS INC.,** 270 Passaic Ave., Passaic, N. J.

•**THE C. S. JOHNSON CO.,** P.O. Box 71, Champaign, Ill.

•**LIPPMANN ENGINEERING WORKS,** 4603 W. Mitchell St., Milwaukee 14, Wis.

NATIONAL CONVEYOR & SUPPLY CO., 350 N. Harding Ave., Chicago 24, Ill.

NORTHERN CONVEYOR CO., 327 W. State St., Janesville, Wis.

•**PETTIBONE-MULLIKEN CORP.,** 4710 W. Division St., Chicago 51, Ill.

SPROUT, WALDRON CO., INC., Muncy, Pa.

TROWBRIDGE CONVEYOR CO., 860 Van Houten Ave., Clifton, N. J.

WEBSTER MFG. INC., Tiffin 16, Ohio

V

VACUUM CLEANING SYSTEMS

JAMES H. MARKLEY, 80 Snyder Road, Ramsey, N. J.

THE SPENCER TURBINE CO., 486 New Park Ave., Hartford 6, Conn.

UNITED STATES HOFFMAN MACHINERY CORP., 105 Fourth Ave., New York 3, N. Y.

VALVES, Air

BERGEN MACHINE & TOOL CO., INC., 189 Franklin Ave., Nutley 10, N. J.

•**CANNON VIBRATOR CO., DIV. THE BERKSHIRE MFG. CO.,** 1111 Power Ave., Cleveland 14, Ohio

THE CLEVELAND VIBRATOR CO., 2828 Clinton Ave., Cleveland 13, Ohio

CURTIS PNEUMATIC MACHINERY CO., 1988 Kienlien Ave., St. Louis 20, Mo.

DIXON VALVE & COUPLING CO., Hancock & Columbia Ave., Philadelphia 2, Pa.

THE FOXBORO CO., Neponset Ave., Foxboro, Mass.

•**THE C. S. JOHNSON CO.,** P.O. Box 71, Champaign, Ill.

KNOX MFG. CO., 226 W. Clinton Ave., Oaklyn, N. J.

MANNING, MAXWELL & MOORE, INC., 250 E. Main, Stratford, Conn.

MINNEAPOLIS - HONEYWELL REGULATOR CO., BROWN INSTRUMENTS DIV., Wayne and Roberts Aves., Philadelphia 44, Pa.

C. A. NORGREN CO., 3400 S. Elati Co., Englewood, Colo.

R-P&C VALVE DIV. AMERICAN CHAIN & CABLE CO., INC., Reading, Pa.

WALWORTH CO., 60 East 42nd St., New York 17, N. Y.

VALVES, Automatic

AUTOMATIC LIQUID METER CO., 1372-1378 E. 15th St., Los Angeles 21, Calif.

THE BRISTOL CO., Waterbury 20, Conn.

• A dot before name indicates advertiser in this issue. See advertiser index.

DIRECTORY

CONCRETE TRANSPORT MIXER CO., 4985 Fyler Ave., St. Louis 9, Mo.

THE CRANE CO., 836 S. Michigan Ave., Chicago 5, Ill.

●**DIAMOND IRON WORKS, INC.**, 1728 North 2nd St., Minneapolis 11, Minn.

●**FLEMING MFG. CO.**, 4985 Fyler Ave., St. Louis 9, Mo.

THE FOXBORO CO., Neponset Ave., Foxboro, Mass.

●**THE C. S. JOHNSON CO.**, P.O. Box 71, Champaign, Ill.

THE MINE & SMELTER SUPPLY CO., 1422 17th St., Denver 17, Colo.

MINNEAPOLIS - HONEYWELL REGULATOR CO., BROWN INSTRUMENTS DIV., Wayne and Roberts Aves., Philadelphia 44 Pa.

PHILADELPHIA GEAR WORKS, Erie Ave. & G Street, Philadelphia, Pa.

VALVES, Bin

BEAUMONT BIRCH CO., 1512 Race St., Philadelphia 2, Pa.

THE BRADY CONVEYORS CORP., 20 W. Jackson Blvd., Chicago 4, Ill.

●**BUTLER BIN CO.**, Box 407, Waukesha, Wis.

●**CANNON VIBRATOR CO., DIV. OF THE BERKSHIRE MFG. CO.**, 1111 Power Ave., Cleveland 14, Ohio

CLEVELAND VIBRATOR CO., 2828 Clinton Ave. W., Cleveland, Ohio

CONCRETE TRANSPORT MIXER CO., 4985 Fyler Ave., St. Louis, Mo.

●**FLEMING MFG. CO.**, 4985 Fyler Ave., St. Louis, Mo.

●**FULLER COMPANY**, Fuller Bldg., Catasauqua, Pa.

HARDY SCALES CO., 5701 So. Atlantic Blvd., Maywood, Calif.

THE JEFFREY MFG. CO., 935 N. 4th St., Columbus, Ohio

●**THE C. S. JOHNSON CO.**, P.O. Box 71, Champaign, Ill.

MECKUM ENGINEERING, INC., Dayton Rd., Ottawa, Ill.

STEPHENS-ADAMSON MFG. CO., 7 Ridgeway Ave., Aurora, Ill.

VALVES, Pulverized Material

BEAUMONT BIRCH CO., 1512 Race St., Philadelphia 2, Pa.

●**BUTLER BIN CO.**, Box 407, Waukesha, Wis.

THE MINE & SMELTER SUPPLY CO., 1422 17th St., Denver 17, Colo.

PULVERIZING MACHINERY CO., 57 Chatham Rd., Summit, N. J.

STEPHENS-ADAMSON MFG. CO., 7 Ridgeway Ave., Aurora, Ill.

VALVES, Slurry

●**FULLER COMPANY**, Fuller Bldg., Catasauqua, Pa.

HILLS-McCANNA CO., 2349 Nelson St., Chicago 18, Ill.

THE MINE & SMELTER SUPPLY CO., 1422 17th St., Denver 17, Colo.

MINNEAPOLIS - HONEYWELL REGULATOR CO., BROWN INSTRUMENTS DIVISION, Wayne and Windrim Aves., Philadelphia 44, Pa.

R-P & C VALVE DIV., AMERICAN CHAIN & CABLE CO., INC., Reading, Pa.

SEPARATION PROCESS CO., Fuller Bldg., Catasauqua, Pa.

WALWORTH CO., 60 E. 42nd St., New York 17, N. Y.

VALVES, Water

CONCRETE TRANSPORT MIXER CO., 4985 Fyler Ave., St. Louis 9, Mo.

THE CRANE CO., 836 S. Michigan Ave., Chicago 5, Ill.

R. & J. DICK CO., P.O. Box 388, Passaic, N. J.

ELECTRIC STEEL FOUNDRY CO., 2141 N. W. 25th Ave., Portland 10, Ore.

●**FLEMING MFG. CO.**, 4985 Fyler Ave., St. Louis 9, Mo.

HILLS-McCANNA CO., 2349 Nelson St., Chicago 18, Ill.

JENKINS BROTHERS, 80 White St., New York 13, N. Y.

●**THE C. S. JOHNSON CO.**, P.O. Box 71, Champaign, Ill.

LAPLANT-CHOATE MFG. CO. INC., 2920 1st Ave. N. E., Cedar Rapids, Iowa

MANNING, MAXWELL & MOORE, INC., 250 E. Main, Bridgeport, Conn.

McNALLY-PITTSBURG MFG. CORP., Pittsburg, Kans.

MINNEAPOLIS - HONEYWELL REGULATOR CO., BROWN INSTRUMENTS DIV., Wayne & Windrim Aves., Philadelphia 44, Pa.

R-P&C VALVE DIV., AMERICAN CHAIN & CABLE CO., INC., Reading, Pa.

WALWORTH CO., 60 East 42nd St., New York 17, N. Y.

R. D. WOOD CO., 1072 Public Ledger Bldg., Philadelphia 5, Pa.

VENTILATORS, Powered, Roof

C. L. AMMERMAN CO., 3719 Third St. N.E., Minneapolis 21, Minn.

THE SWARTWOUT CO., 18511 Euclid Ave., Cleveland 12, Ohio

VIBRATING SCREENS (see Screens, Vibrating)

VIBRATORS for Chutes, Bins, Etc.

●**BUTLER BIN CO.**, Box 407, Waukesha, Wis.

●**CANNON VIBRATOR CO.**, Power Ave., Cleveland 14, Ohio

CHICAGO PERFORATING CO., 2445 W. 24th Pl., Chicago 8, Ill.

THE CLEVELAND VIBRATOR CO., 2828 Clinton Ave., Cleveland 13, Ohio

CONCRETE TRANSPORT MIXER CO., 4985 Fyler Ave., St. Louis 9, Mo.

●**CONTINENTAL GIN CO.**, P. O. Box 2614, Birmingham, Ala.

●**FLEMING MFG. CO.**, 4985 Fyler Ave., St. Louis 9, Mo.

THE HELTZEL STEEL FORM AND IRON CO., 1750 Thomas Road, Warren, Ohio

THE JEFFREY MFG. CO., 935 N. 4th St., Columbus 16, Ohio

●**NEW HAVEN VIBRATOR CO.**, 145 Chestnut St., New Haven 7, Conn.

SPO INC., 7500 Grand Division Ave., Cleveland 25, Ohio

●**SYNTRON CO.**, 450 Lexington Ave., Homer City, Pa.

THE W. S. TYLER CO., 3615 Superior Ave., Cleveland 14, Ohio

VIBRATORS, Concrete Block

BERGEN MACHINE & TOOL CO., INC., 189 Franklin Ave., Nutley 10, N. J.

●**BESSER MFG. CO.**, Alpena, Mich.

CANNON VIBRATOR CO., 1111 Power Ave., Cleveland 14, Ohio

●**CANNON VIBRATOR CO., DIV. THE BERKSHIRE MFG. CO.**, 1111 Power Ave., Cleveland 14, Ohio

THE CLEVELAND VIBRATOR CO., 2828 Clinton Ave., Cleveland 13, Ohio

CONCRETE TRANSPORT MIXER CO., 4985 Fyler Ave., St. Louis 9, Mo.

●**FLEMING MFG. CO.**, 4985 Fyler Ave., St. Louis, Mo.

GENERAL ENGINES CO., 307 Hunter St., Gloucester, N. J.

●**NEW HAVEN VIBRATOR CO.**, 145 Chestnut St., New Haven 7, Conn.

THE GENE OLSEN CORP., 401 Grace St., Adrian, Mich.

SPO INC., 7500 Grand Division Ave., Cleveland 25, Ohio

●**STEARNS MFG. CO. INC.**, 600 E. Beecher St., Adrian, Mich.

●**SYNTRON CO.**, 450 Lexington Ave., Homer City, Pa.

VIBRO-PLUS PRODUCTS, INC., 54-11 Queens Blvd., Woodside, L. I., N. Y.

VIBRATORS, Portable, Concrete

●**BLAW-KNOX DIV. OF BLAW-KNOX CO.**, P.O. Box 1198, Pittsburgh 30, Pa.

CANNON VIBRATOR CO., 1111 Power Ave., Cleveland 14, Ohio

●**CHICAGO PNEUMATIC TOOL CO.**, 6 E. 44th St., New York 17, N. Y.

THE CLEVELAND VIBRATOR CO., 2828 Clinton Ave., W., Cleveland, Ohio

CONCRETE TRANSPORT MIXER CO., 4985 Fyler Ave., St. Louis 9, Mo.

●**DENVER EQUIPMENT CO.**, 1410 Seventeenth St., Denver 17, Colo.

●**FLEMING MFG. CO.**, 4985 Fyler Ave., St. Louis, Mo.

HENNEUSE ENGINEERING CO., Marion, Ohio

HOMELITE CORP., 67 Riverdale Ave., Port Chester, N. Y.

INDEPENDENT PNEUMATIC TOOL CO., 175 State St., Aurora, Ill.

●**MULTIPLEX MACHINERY CORP.**, Elmore, Ohio

●**NEW HAVEN VIBRATOR CO.**, 145 Chestnut St., New Haven 7, Conn.

THE PATTERSON FOUNDRY & MACHINE CO., 1250 St. George St., East Liverpool, Ohio

SPO INC., 7500 Grand Division Ave., Cleveland 25, Ohio

STOW MANUFACTURING CO., 49 Shear St., Binghamton, N. Y.

●**SYNTRON CO.**, 450 Lexington Ave., Homer City, Pa.

THE W. S. TYLER CO., 3615 Superior Ave., Cleveland 14, Ohio

VICTOR ENGINEERING CORP., 27 Maplewood Ave., Philadelphia 44, Pa.

VOLTMETERS

THE BRISTOL CO., Waterbury 20, Conn.

●**GENERAL ELECTRIC CO.**, 1 River Road, Schenectady 5, N. Y.

WESTINGHOUSE ELECTRIC CO., First Nat'l Bank Bldg., Pittsburgh, Pa.

W

WAGONS, Dump

ATHEY PRODUCTS CO., 5631 W. 65th St., Chicago 38, Ill.

●**CATERPILLAR TRACTOR CO.**, Peoria 8, Ill.

EASTON CAR & CONSTRUCTION CO., Easton, Pa.

THE HEIL CO., 3000 W. Montana St., Milwaukee 1, Wis.

LANDIS STEEL CO., 116 W. A St., P.O. Box 248, Picher, Okla.

LAPLANT-CHOATE MFG. CO., INC., 2920 1st Ave. N.E., Cedar Rapids, Iowa

M-R-S MANUFACTURING CO., P.O. Box 336, Flora, Miss.

WOODRIDGE MANUFACTURING CO., Sunnyvale, Calif.

WASHERS, Sand, Gravel, Stone (see Scrubbers)

WEIGH LORRIES

ANCHOR CONCRETE MACHINERY CO., 1191 Fairview Ave., Columbus 12, Ohio

THE ATLAS CAR & MFG. CO., 1100 Ivanhoe Rd., Cleveland 10, Ohio

THE C. O. BARTLETT AND SNOW CO., 6200 Harvard Ave., Cleveland 5, Ohio

BEAUMONT-BIRCH CO., 1512 Race St., Philadelphia 2, Penna.

●**BUTLER BIN CO.**, Box 407, Waukesha, Wis.

CONCRETE TRANSPORT MIXER CO., 4985 Fyler Ave., St. Louis, 9, Mo.

DIFFERENTIAL STEEL CAR CO., Findlay, Ohio

ERIE STEEL CONSTRUCTION CO., 67 Geist Rd. and N.P.R.R., Erie, Penna.

●**FLEMING MFG. CO.**, 4985 Fyler Ave., St. Louis, Mo.

HARDY SCALES CO., 5701 So. Atlantic Blvd., Maywood, Calif.

THE HELTZEL STEEL FORM AND IRON CO., 1750 Thomas Road, Warren, Ohio

THE HOWE SCALE CO., Rutland, Vt.

THE JEFFREY MFG. CO., 935 N. 4th St., Columbus 16, Ohio

●**LINK-BELT CO.**, 300 W. Pershing Road, Chicago 9, Ill.

●**LIPPMANN ENGINEERING WORKS**, 4603 W. Mitchell St., Milwaukee 14, Wis.

MEYER SCALES, INC., 449 Central Ave., Orange, N. J.

●**MULTIPLEX MACHINERY CORP.**, Elmore, Ohio

RICHARDSON SCALE CO., Van Houton Ave., Clifton, N. J.

STEPHENS-ADAMSON MFG. CO., 7 Ridgeway Ave., Aurora, Ill.

TOLEDO SCALE CO., 1090 Telegraph Road, Toledo 12, Ohio

WEBSTER MFG. INC., Tiffin 16 Ohio

WINSLOW GOVT. STANDARD SCALE WKS., INC., 25th and Haythorne Ave., Terre Haute, Ind.

THE YALE & TOWNE MFG. CO., Philadelphia 15, Pa.

WEIGHT RECORDERS

THE BRISTOL CO., Waterbury 20, Conn.

BUILDERS-PROVIDENCE, INC., 345 Harris Ave., Providence 1, R. I.

THE CONVEYOR CO., 3260 East Slauson Ave., Los Angeles 11, Calif.

THE FOXBORO CO., Neponset Ave., Foxboro, Mass.

THE HELTZEL STEEL FORM & IRON CO., 1750 Thomas Rd., Warren, Ohio

HARDY SCALES CO., 5701 So. Atlantic Blvd., Maywood, Calif.

THE HOWE SCALE CO., Rutland, Vt.

● A dot before name indicates advertiser in this issue. See advertiser index.

DIRECTORY

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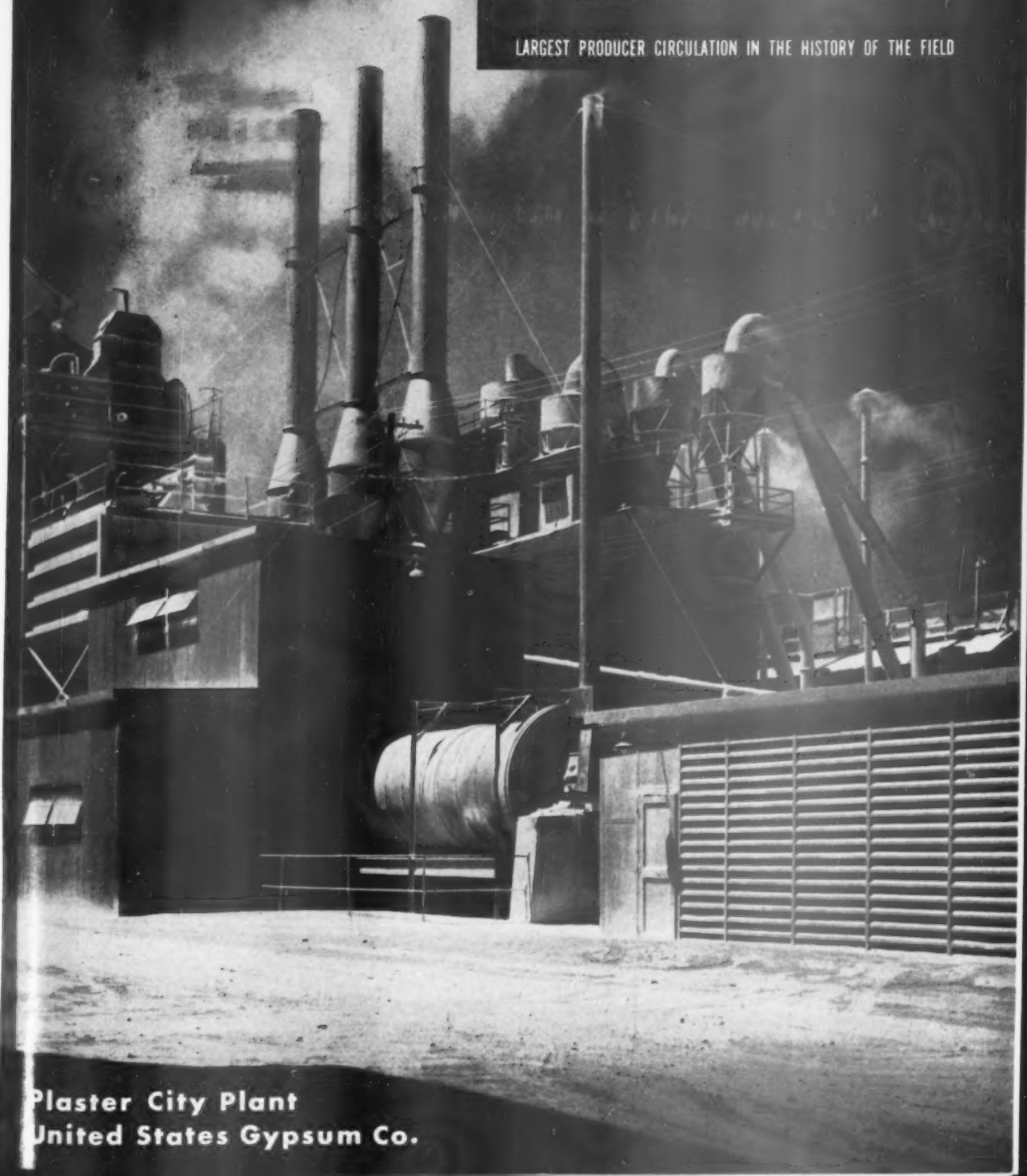

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